REPORT RESUMES

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AN EXPERIMENTAL STUDY UTILIZING CLOSED-CIRCUIT TELEVISION IN THE TEACHING OF DENTAL TECHNIQUES.

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DESCRIPTORS- *CLOSED CIRCUIT TELEVISION, *CONVENTIONAL INSTRUCTION, *EDUCATIONAL EXPERIMENTS, *DENTAL SCHOOLS, LARGE GROUP INSTRUCTION, STUDENT ATTITUDES, TASK PERFORMANCE, ACADEMIC PERFORMANCE, CURRICULUM, TELEVISION CURRICULUM, ATTITUDE TESTS, OBJECTIVE TESTS, VISUAL LEARNING, GRADING, RATING SCALES, SOPHOMORE OPERATIVE DENTISTRY, CCTV, LL SCALE, LD SCALE, VM SCALE

CLOSED CIRCUIT TELEVISION WAS WELL RECEIVED BY DENTISTRY STUDENTS AT NEW YORK UNIVERSITY BUT FAILED TO YIELD SIGNIFICANT GAINS IN ACHIEVEMENT OVER CONVENTIONAL INSTRUCTION. TWENTY-ONE NULL HYPOTHESES WERE TESTED ON 154 MALE SOPHOMORE STUDENTS, WHO WERE DIVIDED INTO GWO GROUPS, HALF BEING INSTRUCTED TO A LARGE EXTENT VIA CCTV, TV CLASS, AND HALF BEING TAUGHT CONVENTIONALLY, CV CLASS. THE GROUPS WERE MATCHED ON THE BASIS OF PREDICTED GRADES ON (1) WRITTEN WORK, AND (2) PRACTICAL WORK. ALTHOUGH, THE CV CLASS HAD A SIGNIFICANT ADVANTAGE ON PREDICTED GRADES IN WRITTEN WORK--COMPENSATED FOR BY USE OF COVARIANCE ANALYSIS--THERE WAS NO SIGNIFICANT DIFFERENCE BETWEEN CV AND TV CLASSES IN ACHIEVED WRITTEN GRADES. IN TWO OF THE THREE TRIMESTERS UNDERTAKEN, LITTLE DIFFERENCE WAS FOUND IN ACHIEVED PRACTICAL WORK BETWEEN THE CLASSES, BUT IN THE THIRD TRIMESTER THE CV CLASS HAD SIGNIFICANTLY HIGHER PRACTICAL GRADES. ATTITUDES TOWARD INSTRUCTION WERE SIGNIFICANTLY MORE FAVORABLE IN THE TV CLASS, BUT THERE WAS NO EXPECTED INTERACTION BETWEEN ATTITUDES AND ACHIEVEMENT. WRITTEN EXAMINATIONS, USING THE FLANAGAN ITEM-SELECTION TECHNIQUE, WERE DEVELOPED AND PRETESTED FOR THE STUDY, AND CHECK-OFF SHEETS WERE DEVELOPED TO STANDARDIZE GRADING OF PRACTICAL WORK. STUDENT ATTITUDES WERE MEASURED BY SCALES WITH AVERAGE RELIABILITY (KUDER-RICHARDSON 20) OF .91 WITH A RANGE OF .88 TO .97. A REVIEW OF THE LITERATURE AND BIBLIOGRAPHY ARE GIVEN. APPENDICES INCLUDE SCALES, TABLES, AND COURSE OUTLINES. (OH)

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A

An Experimental Study Utilizing Closed-Circuit Television in the Teaching of Dental Techniques

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96.

1967

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27 OEG-
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National Defense Education Act, 1958, Title VII.

PREFACE

When the National Defense Education Act of 1958 was passed, the New York University College of Dentistry had been using closed circuit television for about a year and a half. The equipment and facilities were very meager; however, the enthusiasm on the part of the teachers and students was high.

In order to evaluate the utilization of closed circuit television a proposal was submitted to the Department of Health, Education, and Welfare under Title VII of the National Defense Education Act of 1958. The title of the project was "An Experimental Study Utilizing Closed Circuit Television in the Teaching of Dental Techniques." This study began on November 1, 1959, and ended on October 31, 1961. It was supported by the government and by New York University for a total of $247,740.

The experiment was conducted by the Department of Operative Dentistry with Dr. Arthur H. Morrison as the Principal Investigator, Mr. Leon Bloom, Instructor in the Department of Speech at University Heights Center of New York University as the Project Evaluator; Dr. Herbert W. Grinnell, Associate Professor in the Department of Operative Dentistry of New York University College of Dentistry as the Project Teacher; Dr. Sidney Spero, Assistant Professor and Drs. Morton Marcus, Robert Sussman, and Robert Reiss, Instructors in the Department of Operative Dentistry as Teachers. There were also two technicians to maintain and handle the equipment.

A description of the project is as follows and is a copy of an abstract taken from *News and Reports,* United States Department of Health, Education, and Welfare, July 1960:

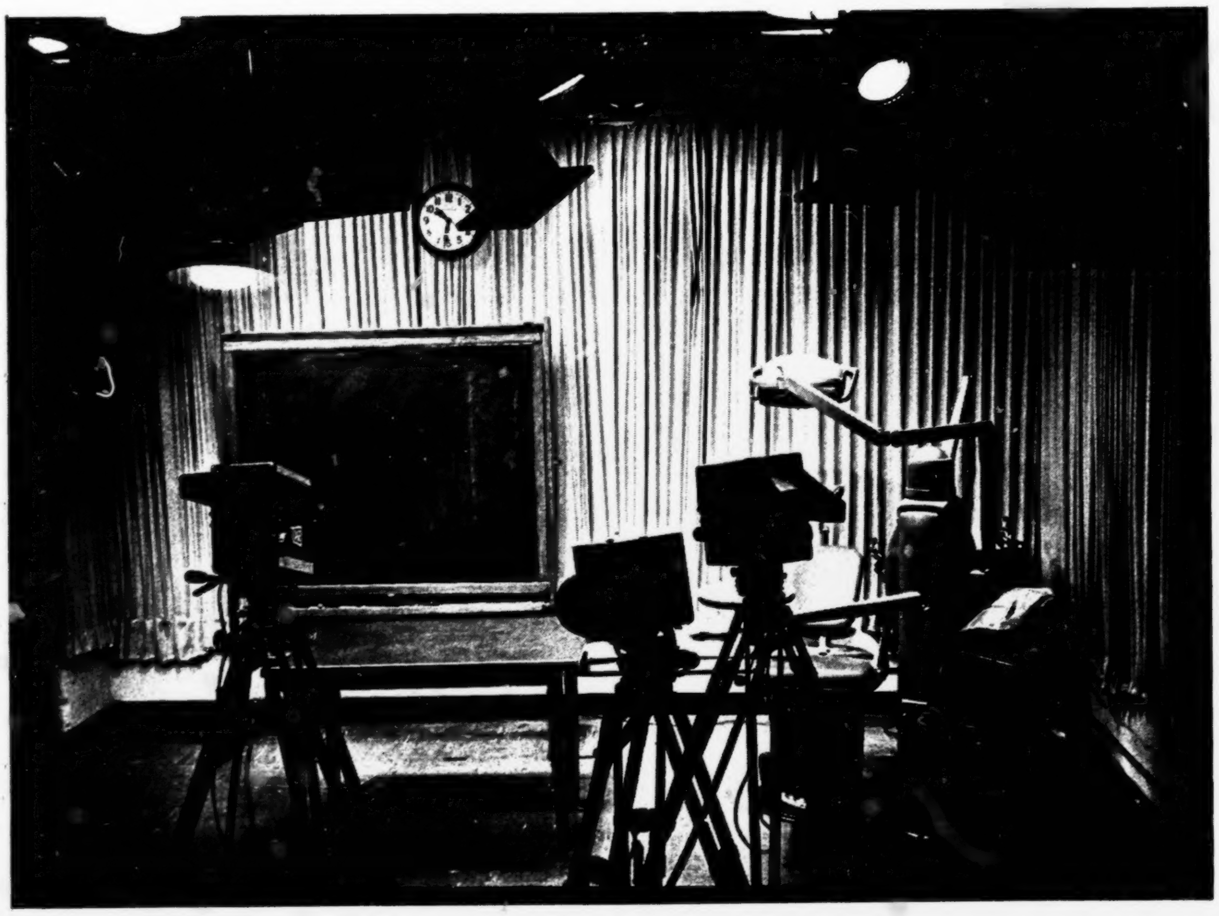
> This study will explore the values of TV instruction for teaching a highly "visual" content largely concerned with imparting facility in manual manipulation (*i.e.*, Operative Dentistry). All students in the Sophomore class will be randomly assigned to either the experimental (TV) or control section of the course. The requisite controls over instructor and content presented will be exerted. The groups will be equated on the basis of measures of aptitude, past achievement and attitude. The evaluative criteria for the investigation of the comparative effectiveness of the two kinds of presentations will consist of the final examination, several laboratory examinations and measures of student attitudes toward the course, the instructor, and TV classes.

Since the sponsoring agency did not allocate funds for permanent installations such as structural modifications, transmitting, etc., a private contribution of ten thousand dollars ($10,000.00) was obtained to renovate the television studio into a small but compact professional broadcasting studio. *Illustration A before renovation, B after renovation.

The television studio is 16 feet x 20 feet with a 13 foot ceiling. It has acoustical tile on the ceiling and an asphalt tile floor. At the right side of the room is a Ritter dental unit and chair.

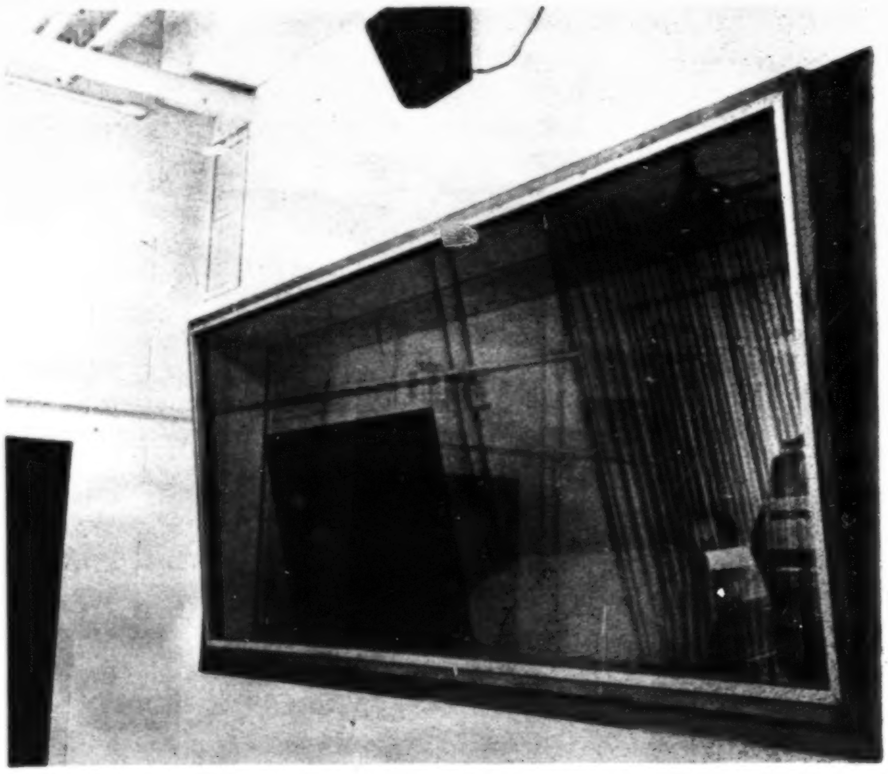
Two Dage model 320A cameras with view finders, and two General Electric model 4TH5A3 cameras without view finders, are integrated with the Dage 320 system. Lighting for the studio is with 4-500W Century scoops and 4-500W Century spots (adjustable focus), supplemented by two Salzman standing spots. All lights are controlled from the control booth.

*Illus. A.
TV Studio
before
Renovation



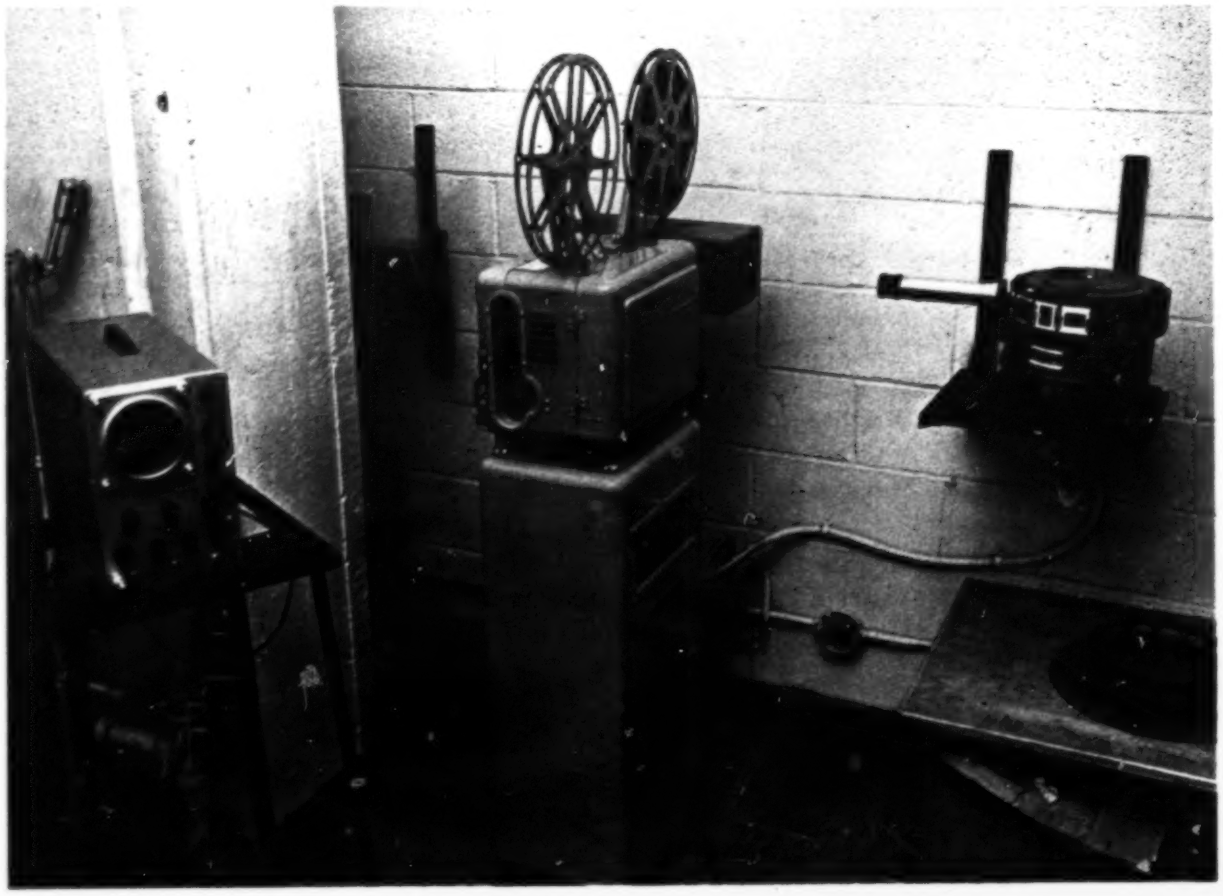
*Illus. B.
TV Studio
after
Renovation

The control room is about 8 feet x 16 feet with a 10 foot x 5 foot double glass window overlooking the studio proper. *Illustration C. The control room floor is elevated 30" above the studio floor affording clear visibility of the entire studio. Attached to the control room is a 16 foot x 9 foot projection room housing a Bell and Howell model 614 16-mm. sound projector, a Select-slide Jr. slide projector by Spindler and Sauppe having a removable slide magazine. Both projectors operate through a Dage multiplexer and one of the two General Electric cameras. *Illustration D.



*Illus. C. Control Room Window Overlooking Studio

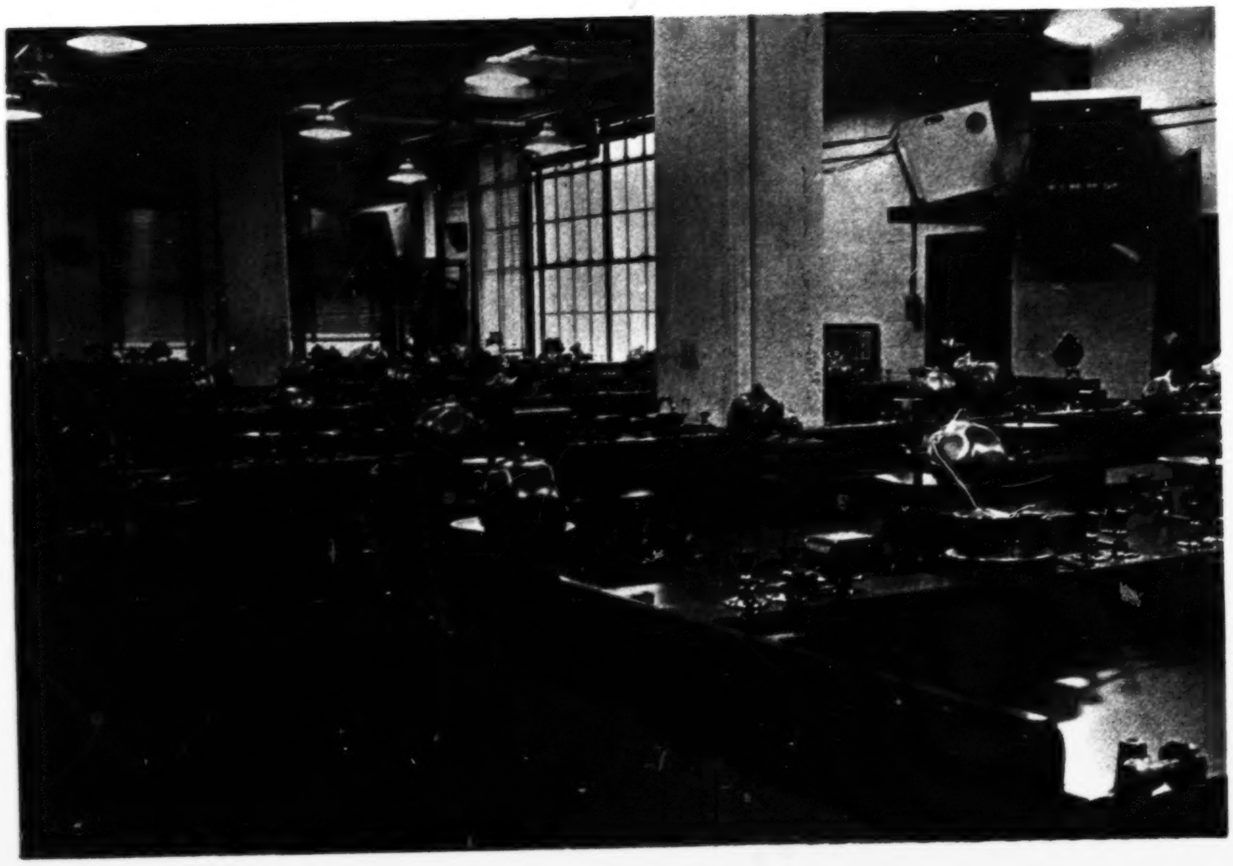
The two Dage cameras have a four lens turret operated from the rear of the camera, and each is equipped with 1", 2", 3", and 6" lenses. A wide angle 17mm. lens and Telephoto 10", 12", and 14" lenses are available when needed. The non-



*Illus. D. Film and Slide Projectors and Multiplexer viewfinder General Electric camera has a remote controlled zoomar lens operated from the control room.

The console in the control room houses two type 720 Dage camera control units and a

*Illus. E. Control Room Console



*Illus. F. View of Laboratory

520 Dage switcher and master monitor. The 520 Dage switcher allows for quick switching, dissolves, or super impositions. *Illustration E. Three standard 72 x 22 x 18 inch racks are also located in the control room housing the necessary power supplies, audio line amplifiers, 410B Sync generators, GE video and ITV video distribution amplifiers, and a Magnerecorder tape recorder for recording the sound portion of any program. The audio console is a custom-built unit, incorporating a LOM-5 channel audio mixer-preamplifier, a standard 10W Stromberg Carlson Monitor amplifier feeding a 30W Lafayette line amplifier.

Both video and sound may be distributed to any one or all of six viewing rooms. Each viewing room or laboratory is equipped with two-way audio system and from four to eight video monitors. Of special interest is the third floor operative dentistry laboratory where two 24" and one 21" Conrac monitors, and five 21" Miratel monitors are located. *Illustrations F, G. Also seven low-impedance wall-mounted microphones are dispersed around the room, enabling the student to ask questions of the TV demonstrator and also to be heard by all viewing the program *Illustration H. Two-way sound is accomplished by high-level switching at each viewing room or laboratory. The output of each viewing room amplifier may feed the room speakers for non-TV use, or it is switched to feed the signal to the control room, where it is padded down and redistributed as part of the TV studio. The control room line amplifier then feeds a signal back to the viewing room speakers. To prevent booming and feedback, low volume sound is used by placing from 12 to 16 speakers around the room in series-parallel arrangement. The video signal output is the standard RETMA signal 1.4 V.P.P. having a 600 line resolution when the Dage 320A cameras are used, and 400 line resolution with the General Electric cameras.

*Illus. G.
Another
View of
Laboratory

At the time of the proposal there had been no evaluation or report of the utilization of closed circuit television in dental education. About sixteen dental schools were using TV and about thirteen schools were planning to procure facilities.

Acknowledgement and thanks are herewith given to the project teacher, the teaching staff, and the project evaluator for this report. The report that follows resulted from the evaluation by Leon Bloom and represents his dissertation submitted in partial fulfillment of requirements for the degree of Doctor of Philosophy at the University of Southern California. Added thanks are given to Dr. Milton Dickens, Chairman of the Dissertation Committee, for having taken an active part in the planning of the original design of the conduct of the study as well as editing the final report.

*Illus. H. Microphone for Two-Way Audio System

Thanks are also given to Dean Raymond J. Nagle of the College of Dentistry, New York University, for permitting this project to be run during the academic school year.

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This dissertation, written by

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under the direction of his Dissertation Committee, and approved by all its members, has been presented to and accepted by the Graduate School, in partial fulfillment of requirements for the degree of

DOCTOR OF PHILOSOPHY

Milton C. Kloetzel
DEAN

Date: January, 1965

DISSERTATION COMMITTEE

Milton Dickens
CHAIRMAN
Robert Rutherford
Victor Garwood
Kenneth Harwood

For M., after all,

and for K. and T., now gone . . .

All gone

Much Love

ACKNOWLEDGEMENTS

I owe a debt to Milton Dickens, Chairman, Division of Communications, for his kindness in assuming the burden of my candidacy. He has helped me to plan my work, to formulate my ideas and to conduct this study. The clarity and focus of this report derives largely, I know, from his patient and careful application of the three R's.

I want to thank the members of my dissertation committee—Victor Garwood, Kenneth Harwood and Robert Rutherford—for the care they devoted to their tasks.

Arthur Morrison, Chairman, Department of Operative Dentistry, College of Dentistry, New York University, made the facilities of the department available for this study. The contributions of the teaching staff of Sophomore Operative Dentistry have been inscribed on many pages of this study.

George B. Sargent II, Chairman, Department of Speech, University College, New York University, made it possible for me to conduct this study and carry on my regular University duties.

During the course of this study I received the assistance of a good many people whose knowledge and experience are greater than my own. I wish to thank Roy Calogeras for his statistical guidance. Most of the calculation work was programmed for the IBM 1620 by Jeffrey Kulick. I also wish to make the following acknowledgements: Elmer Struening—Thurstone and Likert programming; the prepartum Mrs. Elmer Struening—Thurstone and Likert tabulation; J. David Edelstein and Myra Adamthwaite—test administration for Kendall's W; David Isaacs, Anthony Franco, and Robert Rubner—drafting; Marsha Korman—Fisher's Exact Probability Test computation; Dolores Simons, Frank Felberbaum, Alice Hyatt—item editing and selection; Ralph Hall (erroneously identified previously)—Teacher-Rating Scale Construction; Jack Heller, Howard Walowitz, Henry Mullish, and Norman Pollock—data processing; Stanley Bosworth—Likert Administration; Service Bureau Corporation, New York City (A Division of IBM)—multiple regression program, MR 2; Abacus Associates, New York City—Chi Square program; University of California, Los Angeles—Covariance program (BIMD Series). All responsibility is, of course, mine.

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CONTENTS

PAGE

Project Personnel iii

Preface v

Acknowledgements xiii

List of Tables xvii

List of Illustrations xix

CHAPTER

I. The Problem and Definitions of Terms 1
  Origin of the Problem 1
  Statement of the Problem 1
  Significance of the Problem 2
  Definition of Terms 2
  Organization of the Remainder of the Study 3

II. Review of the Literature 4

III. Subjects, Materials and Procedures 15
  The Plan of the Course 15
  The Plan of the Experiment 18
  Subjects 24
  Written Examinations 27
  Practical Grading Criteria 29
  Construction of Attitude Measurements 30
  Teacher Rating Scale 37

IV. Presentation and Interpretation of Data 42
  Achieved Written and Practical Grades 42
  Attitudes Toward the Teachers and the Teaching of the Course 51
  Interaction Between Predicted Grades and Attitudes 59
  Interaction Between Achieved Grades and Attitudes 62
  Attitudes Toward TV as a Teaching Medium 65
  Correlations Between Attitude Measurements 67

V. Summary, Findings and Implications 74
  Summary 74
  Findings 76
  Discussion 78
  Implications 80

APPENDIXES PAGE

APPENDIX A: *Televised Dental Lessons: Sophomore Operative Dentistry 1960-1961* 81

APPENDIX B: *A Television Production Script: Sophomore Operative Dentistry 1960-1961* 83

APPENDIX C: *Predicted Written and Predicted Practical Grades for CV and TV Students* 84

APPENDIX D: *Revised Sophomore Operative Dental Weighted Laboratory Grading Sheet 1960-1961* 86

APPENDIX E: *Laboratory Lecturer Scale* 87

APPENDIX F: *Laboratory Demonstrator Scale* 88

APPENDIX G: *Visual Materials Scale* 89

APPENDIX H: *Pre-Expectancy Inventory* 90

APPENDIX I: *Qualifications of Judges for Teacher Rating Scale* 93

APPENDIX J: *Achieved Written and Achieved Practical Grades for CV and TV Students* 94

APPENDIX K: *Attitude Scores of CV Students* 96

APPENDIX L: *Attitude Scores of TV Students* 98

BIBLIOGRAPHY 101

LIST OF TABLES

TABLE PAGE

1. Regression Coefficients of Ten Independent Variables for Two Predicted Grades: Sophomore Class 1959-1960 26
2. The Means, Standard Deviation and *t*'s for Two Predicted Composite Grades for Matched CV and TV Classes: Sophomore Class 1960-1961 27
3. Coefficients of Concordance and Level of Significance for Ten Dental Preparations 30
4. The Means, Standard Deviations and N's for the Achieved Composite Written Grades and Achieved Composite Practical Grades for 1959-1960 and 1960-1961 31
5. Number of Positive and Negative Thurstone-Items According to Content Category 32
6. Thurstone-Item Summary: Item Content Classified by Scale Category and Positive and Negative Format 33
7. Administration Time of Attitude Measurements for CV and TV Classes: Sophomore Class 1960-1961 36
8. Significant Comparisons for the Teacher Rating Scale by Means of Fisher's Exact Probability Test 40
9. The Means and *t*'s for the Achieved Written and Achieved Practical Grades for CV and TV Classes: Trimesters I, II, and III 43
10. The Adjusted Means and Adjusted F's for Achieved Written and Achieved Practical Grades: Trimesters I, II, and III 44
11. The Means, N's and *t*'s for Top, Middle and Low Written-Aptitude Trichotomies for CV and TV Classes 46
12. The Means, N's and *t*'s on Achieved Written Grades for Each Written-Aptitude Trichotomy: Trimesters I, II, and III 47
13. The Adjusted Means and Adjusted F's for Achieved Written Grades for Each Written Aptitude Trichotomy: Trimesters I, II, and III 48
14. The Means, N's and *t*'s for Top, Middle and Low Practical-Aptitude Trichotomies for CV and TV Classes 48
15. The Means, N's and *t*'s on Achieved Practical Grades for Each Practical Aptitude Trichotomy: Trimesters I, II, and III 49
16. The Adjusted Means and Adusted F's for Achieved Practical Grades for Each Predicted Practical-Aptitude Trichotomy: Trimesters I, II, and III . . . 50
17. The Kuder-Richardson 20 Reliability for Each Attitude Measurement in the CV and TV Classes: Trimesters I, II, and III 51
18. The LL Scale: The Means and *t*'s for the CV and TV Classes: Trimesters I, II, and III 52

TABLE PAGE

19. The LL Scale: The *t*'s for Across-Time Comparisons Within Each of the CV and TV Classes and for Across-Time and Across-Class Comparisons: Trimesters I, II, and III 54

20. The LD Scale: The Means and *t*'s for the CV and TV Classes: Trimesters I, II, and III 55

21. The LD Scale: The *t*'s for Across-Time Comparisons Within Each of the CV and TV Classes and for Across-Time and Across-Class Comparisons: Trimesters I, II, and III 56

22. The VM Scale: The Means and Across-Class *t*'s for the CV and TV Classes: Trimesters I, II, and III 57

23. The VM Scale: The *t*'s for Across-Time Comparisons Within Each of the CV and TV Classes and for Across-Time and Across-Class Comparisons: Trimesters I, II, and III 58

24. The CV Class: The Chi-Square Value for Both Predicted Composite Written and Practical Grades and Each Attitude Measurement: Trimesters I, II, and III 60

25. The TV Class: The Chi-Square Value for Both Predicted Composite Written and Practical Grades and Each Attitude Measurement: Trimesters I, II, and III 61

26. The CV Class: The Chi-Square Value for Achieved Written and Achieved Practical Grades and Each Attitude Measurement: Trimesters I, II, and III 63

27. The TV Class: The Chi-Square Value for Achieved Written and Achieved Practical Grades and Each Attitude Measurement: Trimesters I, II, and III . 64

28. The Pre- and Post-EX Inventories: The Means and *t*'s for Across-Class and Within-Class Comparisons for the CV and TV Classes: Trimesters I, II, and III 66

29. The CV Class: Zero Order Correlations Between Selected Attitude Measurements and *t*'s for Tests of Significance Between Correlations: Trimesters I, II, and III 68

30. The CV Class: First Order Partial Correlation Between Selected Attitude Measurements and *t*'s for Tests of Significance Between Correlations: Trimesters I, II, and III 69

31. The TV Class: Zero Order Correlations Between Selected Attitude Measurements and *t*'s for Tests of Significance Between Correlations: Trimesters I, II, and III 70

32. The TV Class: First Order Partial Correlations Between Selected Attitude Measurements and *t*'s for Tests of Significance Between Correlations: Trimesters I, II, and III 71

LIST OF ILLUSTRATIONS

FIGURE PAGE

A. TV Studio before Renovation vi

B. TV Studio after Renovation vi

C. Control Room Window Overlooking Studio vii

D. Film and Slide Projectors and Multiplexer vii

E. Control Room Console viii

F. View of Laboratory viii

G. Another View of Laboratory ix

H. Microphone for Two-Way Audio System x

1. Operative Technic Laboratory—Floor Plan—TV Group Student Identification Numbers 16

2. Operative Technic Laboratory—Floor Plan Front Wall Detail from Figure 1 17

3. Operative Technic Laboratory—Conventional Group—Student Identification Seating Numbers 18

4. Operative Technic Laboratory—Transverse Section between Rows G and H Viewing Toward Right Wall 19

5. Operative Technic Laboratory—Front View—Student Desk 20

6. Operative Technic Laboratory—Top View—Student Desk 21

7. TV Studio Floor Plan 22

Chapter I

THE PROBLEM AND DEFINITIONS OF TERMS

ORIGIN OF THE PROBLEM

The potentialities of television as a teaching instrument have been explored by numerous investigators during recent years. A typical research approach has been to compare television teaching with conventional classroom teaching. In most of these studies, however, the materials taught were predominantly conceptual (*e.g.*, history), and the teaching method was predominantly verbal (*e.g.*, lectures). No major study was found which dealt with the teaching of manual or digital skills, the teaching of which normally requires heavy emphasis on "how-to-do-it" demonstrations. This latter type of subject matter and its attendant teaching method appeared to be well illustrated by the course in Sophomore Operative Dentistry offered by the College of Dentistry at New York University.

Theoretically, it seemed reasonable that closed-circuit television ought to be especially well adapted to the teaching-by-demonstration of operative dentistry techniques. This line of reasoning was explored by the investigator in discussions with members of the faculty and administration of the College of Dentistry. The result was that during the academic year of 1958-1959 arrangements were made for a two-year series of experiments testing the effectiveness of television teaching in Sophomore Operative Dentistry. The school year of 1959-1960 was devoted to the development of various grading systems, attitude scales, and other necessary experimental tools. The final experiments were conducted throughout the three trimesters of the academic year of 1960-1961.

STATEMENT OF THE PROBLEM

The general problem of this study was to compare the effectiveness of television teaching with conventional teaching of Sophomore Operative Dentistry. This general problem was subdivided into the following constituent null hypotheses:

1. There is no significant difference between the grades achieved in the conventional class and the grades achieved in the television class. This hypothesis was subdivided to permit comparisons between two different types of grades (the grades for written work and the grades for practical work), and also comparisons between high aptitude, middle aptitude, and low aptitude students.
2. There is no significant difference in attitudes toward the course:
   a. within each trimester, between the conventional class and the television class,
   b. within each class, between any two trimesters, and
   c. between any trimester for one class and any trimester for the other class.

   This hypothesis was further subdivided to permit comparisons of attitudes toward the Laboratory Lecturer, attitudes toward the Laboratory Demonstrators, and attitudes toward the Visual Materials used in teaching the course.

3. There is no significant interaction between predicted grades and measurements of attitudes toward the course. This hypothesis was subdivided to permit comparisons between two types of predicted grades (written and practical), and within the conventional and television classes.
4. There is no significant interaction between achieved grades and measurements of attitudes toward the course. This hypothesis was subdivided to permit comparisons between the written grades and the practical grades and, also, comparisons within each class (conventional and television).
5. There is no significant difference between students' attitudes toward television as a teaching medium when those attitudes are measured before the beginning of the course and when measurements are made at the close of each trimester. This hypothesis was subdivided to permit comparisons both within and between the two classes (conventional and television).
6. There is no significant correlation within each class (conventional and television) between any of the several attitude measurements. This hypothesis was subdivided to permit comparisons both within and between trimesters.

In Chapter IV the above hypotheses are presented in greater detail in order to clarify the steps taken in the statistical processing of the data.

SIGNIFICANCE OF THE PROBLEM

This study was thought to be significant for several reasons. In general, at the time of this study, many leading educators were intrigued by the potentialities and curious about the limitations of television as a new teaching medium; they were especially interested because of the rapidly rising school enrollments. More specifically, however, this study originated from a desire to fill a research gap. Previous studies of teaching by television had focused on traditionally "lecture" subjects, such as history, general psychology, or English literature. Little experimental research had focused on the teaching of subjects requiring manual skills, such as operative dentistry. A priori reasoning suggested that *visual* demonstration might be a uniquely common bond between the nature of the television medium and the nature of the task of teaching manual skills.

The above line of reasoning appealed not only to this experimenter but also to the Dean and to the Faculty of the College of Dentistry of New York University. Therefore a research proposal was jointly evolved.

DEFINITION OF TERMS

Achieved grades.—The grades received by a student for work submitted (cf. definition below of "predicted grades").

Aptitude.—Those students in the top predicted third of each class are defined as "high-aptitude" third. Those in the bottom predicted third are defined as "low-aptitude" third. Those in the middle predicted third are said to be in the "middle aptitude" third.

Conventional class.—A class in Sophomore Operative Dentistry that was taught without television (the control group).

Expectancy inventory.—A series of twenty-five items in which students were asked to rate their expectations of television teaching *in comparison with* conventional teaching.

Laboratory demonstrator scale.—A series of eighteen items that focused on attitudes toward laboratory demonstration work in Sophomore Operative Dentistry.

Laboratory lecturer scale.—A series of thirty-two items that focused on attitudes toward laboratory lecture work in Sophomore Operative Dentistry.

Practical grades.—The grades received for practical dental preparations (i.e., laboratory projects) in Sophomore Operative Dentistry.

Predicted grades.—On the basis of previous grades and on the basis of the American Dental Association aptitude test, each student's written and practical grade was estimated by means of two multiple correlation equations (cf. definition above of "achieved grades").

Television class.—The class in Sophomore Operative Dentistry that was taught to a large degree by means of television (the experimental group).

Trimester.—At the time of this experiment, 1960-1961, the academic year of thirty-two weeks at the College of Dentistry, New York University, was divided into thirds, or trimesters, of eleven, eleven and ten weeks each.

Visual materials scale.—A series of eighteen items that focused on attitudes toward the visual materials used in Sophomore Operative Dentistry.

ORGANIZATION OF THE REMAINDER OF THE STUDY

A review of the literature will be presented in Chapter II. This will be followed by a description of the subjects, materials, and procedures used in this study (Chapter III). The first section of this chapter will describe the organization and method of teaching in Sophomore Operative Dentistry. Then will come the plan of the experiment, a description of the students used in this experiment, and the procedures by which they were assigned to conventional or television classes. This will be succeeded by a description of the procedures used to construct the written examinations and the method used to grade practical work in the laboratory. After this, the procedures by which attitude scales and inventories were constructed will be described. Chapter III will close with a description of a rating scale used by qualified judges to evaluate the similarity in lessons. Chapter IV will present the data and interpret them. The last chapter, Chapter V, will summarize, list the findings, and discuss the implications.

Chapter II

REVIEW OF LITERATURE

In 1959 the Ford Foundation and the Fund for the Advancement of Education summarized the results of "teaching by television" studies it had sponsored for the previous five years in twenty-five colleges and 100 school systems by saying that out of 110 studies in which legitimate comparisons could be made as a result of matching and pretesting between conventional and television groups, thirty-eight studies showed statistically significant differences in the achievement of conventional versus television classes and that twenty-nine of these differences were in favor of television teaching, with nine in favor of conventional teaching.[1]

The two most extensive of this series of studies in higher education took place at Pennsylvania State University from 1954 to 1958. In the first of these studies courses taught over television were deliberately kept as similar as possible to conventional teaching.[2] In this study the courses used for experimental purposes were a lecture-demonstration section of General Chemistry, two full semesters of General Psychology and one semester of the Psychology of Marriage.[3] The criteria used to evaluate the data from these courses were objective course examinations, attitudes toward instruction, change in attitudes in relation to course objectives, and students' selection of future courses.[4] The attitudinal criteria toward instruction were measured by an informal check list containing open-ended questions, and a Guttman scale to examine personal relevance of the course.[5] Television students were also asked to estimate probable learning and interest in comparison with conventional instruction—at different times during the year.[6] This study used three groups of students. One group was made up of conventional classes. The second was made up of television classes that were held in the television production room and the third group was made up of television classes in the more familiar television reception rooms.

In General Chemistry the same series of lectures taught students in both conventional and television classes so that each student received the same lectures and demonstrations from the same instructors.[7] The Psychology of Marriage classes did not have a control group and one instructor presented the lecture to the television classes. In General Psychology, however, two instructors each taught both control and experimental classes.[8]

The results of this study showed that, generally speaking, so far as several tests of academic achievement go, the differences among groups were not statistically significant.[9] In terms of general attitudes toward television, television was generally accepted.[10]

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[1] *Teaching by Television*, A Report from the Ford Foundation and the Fund for the Advancement of Education (New York: Ford Foundation, 1959), p. 54.

[2] *Ibid.*, p. 11.

[3] C. R. Carpenter and L. P. Greenhill, Instructional Television Research, Project No. 1, *An Investigation of Closed Circuit Television Courses for Teaching University Courses* (University Park, Pa.: Pennsylvania State University, 1955), pp. 16-19.

[4] *Ibid.*, p. 39.

[5] *Ibid.*, p. 41ff.

[6] *Ibid.*, p. 48.

[7] *Ibid.*, p. 21.

[8] *Ibid.*, p. 18.

[9] *Ibid.*, p. 48.

[10] *Ibid.*, p. 54.

The authors of this study concluded that the degree to which their conclusions could be generalized to courses, methods and students other than those samples in their work remained to be determined.[11]

In the second study at Pennsylvania State University from 1955 to 1957 some twenty undergraduate courses were examined.[12] On the basis of comparisons for seven of these courses with the same instructors teaching conventional and television sections,[13] the authors concluded that controlled experiments with the same teachers were unlikely to yield statistically significant differences between achievement scores.[14]

This study also examined the effects on achievement of distance from the source of instruction;[15] the effect on achievement of varied class size in the television room; the significance of the variation in composition of the television classes in terms of varying sex, as well as different kinds and amounts of television class supervision.[16] Further factors were as follows: rotation of students through television and conventional instruction; different ways of providing opportunities for discussion and question-answer exchanges; variation in television teaching methods; measurements of the effect of television on course-related attitudes toward social issues, careers, et cetera.[17]

Instead of using attitude scales, this study compared individual verbal preferences for future classes—television or conventional—with students' behavioral choices.[18] Generally, there was little relation between verbally expressed choice and behavioral choice and little relation, as well, between achievement in courses and behavioral choice.

Another technique used to assess student attitudes was to allow television classes to decide by majority vote whether to continue with television. These choices were made after rotating several classes through television and conventional instruction. Analysis of student choices showed that differences between television and conventional instruction were not great enough to result in very strong negative or positive preferences for either procedure.[19]

Another pair of studies, also sponsored by the Fund for the Advancement of Education, was conducted at Miami University, Oxford, Ohio. These studies included comparisons with large classes as well as conventional and television instruction. In the first study at Miami, each class used the teaching techniques best suited to it.[20] The courses included most of the lower division curriculum. The hypotheses were concerned with several factors: (1) achievement and its interaction with ability and attitude, (2) student perception of instructor and course effectiveness, (3) attitudes toward conventional instruction as well as toward large classes, and (4) influence of instructor effectiveness and ability on attitudes toward television.[21]

The experimental and control groups at Miami were taught by the same instructor; the students in each of these groups were matched prior to the start of the study on several standardized achievement tests and grade point average. The matching procedure yielded no statistically significant differences.[22] There were two general criteria: final examination and three Thurstone-type attitude scales to instructor, to course, and to television.[23]

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[11] *Ibid.*, p. 48.

[12] C. R. Carpenter and L. P. Greenhill, Instructional Television Research, Project No. 2, *An Investigation of Closed Circuit Television Courses for Teaching University Courses* (University Park, Pa.: Pennsylvania State University, 1958), p. 4ff.

[13] *Ibid.*, p. 10. [14] *Ibid.*, p. 18. [15] *Ibid.*, p. 18. [16] *Ibid.*, p. 23. [17] *Ibid.*, p. 36.

[18] *Ibid.*, pp. 73-74. [19] *Ibid.*, p. 82.

[20] F. G. Macomber, *Experimental Study in Instructional Procedures* (Oxford, Ohio: Miami University, 1956), p. 3.

[21] *Ibid.*, pp. 16-17.

This study presented the following findings: (1) television presentation did not effect achievement, generally, (2) level of ability did not interact with section assignment to determine achievement, (3) achievement remained constant regardless of attitude, generally, (4) there were no significant differences between effectiveness ratings of an instructor on television as compared with the same instructor in the conventional classroom, (5) there was a pronounced tendency for conventional course content to be rated more favorably than television course content, (6) no consistent generalization could be made on student attitudes toward television, (7) in choosing future types of instruction, students preferred conventional teaching, (8) the most disturbing aspect of television to students was lack of contact with the instructor, (9) attitudes toward television shifted negatively as the term went on, (10) there was an inverse relationship between academic ability and television attitude although this relation was overcome in courses taught by instructors receiving a high instructor rating, and (11) a preliminary bias about television was kept during the term. In addition, this study asked whether or not the comparative effectiveness of television may not have been partially dependent upon the type of subject matter taught.[24]

The second study at Miami used twenty departments[25] and stressed further improvement in the methods of television teaching.[26] The instructors were allowed to organize the courses as they wished so that no comparisons could be made among courses.[27] However, the conventional and television instructor were the same.[28] One new feature of this study was a brief course content pretest.[29] In addition, course related attitudes and such areas as critical thinking, synthesis, et cetera, were measured. The conventional and television classes were matched on several academic aptitude tests.[30]

This second Miami Study showed that (1) students in television generally acquired about as much basic subject matter as did conventional students, (2) in general, there was no justification for selecting students for assignment to either conventional or television classes on the basis of their ability, (3) student attitudes toward the method of instruction did not influence achievement, (4) there was a pronounced tendency for instructors to be rated as more effective in conventional classes than on television, (5) generally, most students in television classes preferred to be in the conventional class, (6) the instructor was a major determinant of student attitudes toward television, (7) students became progressively disenchanted with television as the year progressed, (8) attitudes toward television were independent of the level of academic ability, and (9) preliminary biases toward television persisted throughout the year.[31]

Robert Dreher and Walcott H. Beatty, in a Fund for the Advancement of Education study at San Francisco State College, focused on a somewhat different problem.[32] They set up three teaching groups: (1) a control group taking conventional instruction on the campus, (2) an on-campus television class, and (3) an at-home television group.[33] The same instructors were used for conventional and television instruction. In this study four types of courses were used: three freshman classes in Psychology, Basic Communication, Creative Arts and one sophomore class in Economics.[34] The teaching procedure in each class made use of television's unique facilities. The authors say it is an open question, therefore, whether the courses are really comparable.

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[22] *Ibid.*, p. 18. [23] *Ibid.*, pp. 18-20. [24] *Ibid.*, pp. 41-42.

[25] F. G. Macomber, *Experimental Study in Instructional Procedures,* Report No. 2 (Oxford, Ohio: Miami University, 1957), p. 7.

[26] *Ibid.*, p. 6. [27] *Ibid.*, p. 8. [28] *Ibid.* [29] *Ibid.* [30] *Ibid.*

[31] *Ibid.*, pp. 2-4.

[32] Robert E. Dreher and W. H. Beatty, *An Experimental Study of College Instruction Using Broadcast Television* (San Francisco, Calif.: San Francisco State College, 1958).

The hypotheses focused on four areas: (1) increase in knowledge, (2) course-related attitudes, i.e., increase in insight and self acceptance, (3) attitudes toward learning and sociometric relations, and (4) student suitability for teaching media.[35]

Dreher and Beatty did not match students because of administrative difficulties and, for the same reason, students at San Francisco State College could not be randomized.[36] However, the following pretest comparisons were made: (1) Edwards' Personal Preference Schedule—to discover possible differences in motivational bias, (2) Auding Test, Form C, to examine possible differences in deriving meaning from spoken material, (3) standardized college entrance tests—the ACE and School and College Ability Test (SCAT), and (4) previous grade point averages.[37] Dreher and Beatty trichotomized their data on the basis of grade point average, the ACE and SCAT in order to examine ability interaction.[38]

The San Francisco results demonstrated that (1) on the basis of pretest data, the various conventional and television groups were comparable,[39] (2) there were no differences in achievement between conventional and television classes,[40] (3) the high grade point average students in Psychology did better in both television sections than in conventional classes, although this was not true for high grade point average students in Economics,[41] (4) students with low grade point average showed equal gains in achievement regardless of teaching media but this was not true, however, for on-campus television sections in Psychology,[42] (5) generally, with regard to gains in knowledge, high aptitude students taught by television tended to gain significantly more than those in the conventional classroom and low aptitude students showed comparable gains regardless of teaching media,[43] (6) neither high nor low auding ability affected, differentially, the performance of students in conventional or television classes;[44] and (7) there was no clear-cut indication that the need to achieve, as measured by Edwards' Personal Preference Schedule, was related to performance of students in each of the media groups.[45]

An informal questionnaire, limited in scope, yielded a great many findings difficult to describe briefly. Generally speaking, though, at-home television students reacted favorably while on-campus television students were somewhat negative. So far as future choice of teaching media, most students chose regular instruction.[46]

Another Fund for the Advancement of Education study in the state of Oregon used simultaneous telecasts to three or four colleges throughout the state to first and second year students in History, Chemistry, English, and Education.[47] Most often, television teaching was supplemented by regular class instruction. In one course—History—the entire course was televised.

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[33] *Ibid.*, p. 9. [34] *Ibid.*, p. 11. [35] *Ibid.*, pp. 8-9. [36] *Ibid.*, p. 10. [37] *Ibid.*, pp. 12-13.
[38] *Ibid.*, p. 24. [39] *Ibid.*, p. 20. [40] *Ibid.*, p. 22. [41] *Ibid.*, p. 24. [42] *Ibid.*, p. 24.
[43] *Ibid.*, p. 29. [44] *Ibid.*, p. 30. [45] *Ibid.*, p. 31. [46] *Ibid.*, p. 38.

[47] Glenn Starlin and John E. Lallas, *Inter-Institutional Teaching by Television in the Oregon System of Higher Education*, Report No. 1 (Eugene, Oregon: Oregon State System of Higher Education, 1960), p. 5.

Two of the purposes of the state-wide Oregon study were to evaluate the effectiveness of television teaching as opposed to conventional teaching and to determine student attitudes.[48] In addition, problems relating to inter-institutional television were investigated as well as faculty attitudes.[49] The achievement criteria were final examinations. The ACE was used as a measure of "initial" academic ability in order to provide a basis for use of co-variance.[50] The Oregon study also examined the interaction both of attitudes and aptitudes and of attitudes and grades.[51]

In order to investigate attitudes, questionnaires, Likert atttitude scales, interviews and controlled observations were used.[52] These were administered pre-, during and post-. When examining pre-experimental attitude, the Oregon study found that a large majority felt that they would learn as much or more from television, that the quality of television would be the same as or better than conventional instruction, that the calibre of professors would be the same or better; and a majority felt, also, that attention in television classes would be the same as or better than in conventional classes. A majority were concerned about the possibility of less personal contact and about the lack of opportunity for asking questions.[53]

From a post-test point of view, the majority of students in Chemistry and Literature seemed to feel that televised instruction was equal to or better than conventional instruction with respect to the following factors: quality of lecture, standards of student achievement, visual aids and degree of student satisfaction from lectures.[54]

The results of this study were in line with the general trend of studies showing that television students did at least as well on grades.[55] The Oregon study, in underscoring the weight of evidence that showed no statistically significant difference between grades on conventional and television instruction, noted that there was no justification for continuing comparative effectiveness studies except for unique elements.[56]

In examining the relation between pre-experimental attitudes and post-experimental attitudes to inter-institutional television, three conclusions were reached: (1) at the end of the first term, student responses showed a significant increase in approval of inter-institutional television in Chemistry when compared with their pre-experimental opinion, (2) in post-experimental responses, History students showed a slight difference from pre-experimental estimates, (3) in Education the post-experimental acceptance in two institutions showed a slight increase over pre-experimental acceptance while at another institution there was a decrease.[57]

Apparently, pre-experimental attitudes toward inter-institutional television can be modified by participation in a television course; attitudes need not necessarily undergo a "disenchantment" effect.

What prompted the present study was a very narrow observation: at the time of the start of this study, no experiment had examined full-scale professional instruction for a graduate degree whose content was highly "visual" and largely concerned with imparting facility in manual manipulation for a full academic year; no study had been made of the teaching of the technics of operative dentistry via television. It seemed reasonable to suppose that television would be well adapted to the teaching of a course of this type.

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[48] *Ibid.*, p. 4.
[49] *Ibid.*
[50] *Ibid.*, p. 12.
[51] *Ibid.*, p. 40.
[52] *Ibid.*, p. 22.
[53] *Ibid.*, p. 25.
[54] *Ibid.*, p. 38.
[55] *Ibid.*, 21.
[56] *Ibid.*
[57] *Ibid.*, p. 39.

The most extensive series of experiments comparing conventional and television instruction, from the point of view of examining a variety of education problems and of designing research to answer immediate questions, was carried out by the Departments of the Army and of the Navy of the United States. Some of these studies examined the suitability of differing course content and, although there seem to be many advantages to teaching manual skills visually, only one study dealt with manual techniques.

Runyon, Desiderato and Kanner concluded after three hours of training calling for manipulation of small parts: "Television instruction is particularly adaptable to training situations which require manipulation of small equipment pieces by the trainees."[58] They noted also that the applicability of military studies to advanced graduate work was unknown and raised the problem of the distinction between civilian and military pedagogy.[59]

With the exception of the Oregon study, all of these studies were available in 1958. They were selected for review because they dealt with post-high school education (some Fund for the Advancement of Education studies were concerned with elementary and high school), and because they focused on particular experimental methodologies in dealing with relationships between conventional and television teaching. Plans for the present study were completed during 1958 after examination of these studies. After these plans were completed and also after this study was underway additional studies appeared dealing with teaching by television. Some of these later studies having a particular relation in terms of methodology, findings, or subject matter are reported below.

In a dissertation at Syracuse University completed in 1958 Bailey reported on the teaching of first semester general college physics via television.[60] Maximum use was made of visual material, and demonstration equipment was used in nearly every lecture. Film strips were also used. The same test was used as a pre-test measure and at the end of the term. Change from pre-test score was used as a gauge of student achievement. Examination of pre-test data showed no significant differences between conventional and television classes. The final examinations yielded no significant differences between the two types of instruction. Generally speaking, also, student attitudes were not favorable toward television at the end of the course.

In a Fund for the Advancement of Education study Honig, Seibert and Moses reported on the utilization of audiovisual aids in the teaching of general chemistry laboratory work at Purdue University during the Fall 1957 semester.[61] Students were divided into conventional and television sections. The television sections were taught as follows: at the start of the laboratory period a brief lecture was presented to all students for about ten to fifteen minutes via television.[62] After the lecture students were allowed to choose one of several special viewing rooms where detailed laboratory methods were presented either by means of slides, telecast films, or live television.[63] However, these choices were optional and students could omit this activity if they desired.[64]

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[58] R. P. Runyon, O. L. Desiderato and J. H. Kanner, "Factors Leading to Effective Television Instruction," *Audio-Visual Communication Review*, III (Summer, 1955), 267-268.

[59] J. H. Kanner, R. P. Runyon and O. L. Desiderato, "Television as a Training and Educational Medium," *Audio-Visual Communication Review*, III (Summer, 1955), 164.

[60] Herbert S. Bailey, "Teaching Physics in Closed-Circuit Television" (unpublished Ph.D. dissertation, Syracuse University, Syracuse, N.Y., 1958), Abstract, *Dissertation Abstracts*, 19:1947, No. 8, 1959.

[61] J. M. Honig, W. S. Seibert, and D. F. Moses, *The Utilization of Audio-Visual Aids in the General Chemistry Laboratory Work at Purdue University* (Lafayette, Indiana: Department of Chemistry, Purdue University, May, 1958), p. 1.

The Purdue study concluded, using a variety of questionnaires, that experimental attitudes toward television were significantly higher than conventional attitudes,[65] that both control and experimental attitudes became less favorable as the term progressed, and most important,[66] that there were no significant differences on laboratory grades and on final examination between conventional and experimental students.[67]

In 1960 Seibert and Honig reported on a small scale chemistry laboratory study at Purdue covering two lessons[68] and taking twenty to thirty minutes each.[69] A part of each lesson was televised film.[70] The only important aspect of this report, from the point of view of this study, was the very careful means used to evaluate laboratory work.[71] A weighted scoring sheet was developed, listing the several steps needed to perform the laboratory work properly. The reliability of the laboratory scores was .89. A vocabulary test was used as a pre-test to check inter-group comparability and to serve as a covariate.[72] There were no significant differences between the vocabulary scores.[73] In addition pre-tested, written, objective knowledge tests were given.[74] Siebert and Honig felt that the knowledge test was not sufficiently discriminating;[75] stating this differently, no significant differences were found on grades between classes. Also, no item in itself was sufficiently discriminative between groups.[76] The authors examined the step-by-step laboratory grading criteria in order to find specific strengths and weaknesses in the conventional and television classes. They found that some items did discriminate between groups but also that items that were poorly covered in class, according to teachers' judgment, did discriminate between groups.[77]

Two United States Army studies appeared in 1960 and 1961—both dealing with a comparison of black-and-white versus color television. Three hundred and sixty-eight enlisted men[78] were involved in an eleven-lesson course in electronics and photography.[79] Testing was carried out immediately after each lesson.[80] The course content was not concerned with laboratory work. This study, and a second or follow-up Army color study which increased the use of color sharply over their first study,[81] came to the same conclusion: there were no significant differences in trainee learning between black-and-white and color classes.[82,83]

McGuire and his associates at the University of Mississippi Medical School were also concerned with the teaching of demonstration work.[84] They evaluated the conventional and television teaching of one lesson—effects of pharmacological agents on contraction of a nictitating membrane. However, this did not involve manipulating learning and the immediate test was written. McGuire found no statistically significant difference between his two classes.[85]

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[62] *Ibid.*, p. 6. [63] *Ibid.*, pp. 2, 4. [64] *Ibid.*, p. 6. [65] *Ibid.*, p. 22. [66] *Ibid.*

[67] *Ibid.*, p. 38.

[68] W. F. Seibert and J. M. Honig, "A Brief Study of Televised Laboratory Instruction," *Audio-Visual Communication Review*, VIII (May-June, 1960), 117.

[69] *Ibid.*, p. 118. [70] *Ibid.*, p. 117. [71] *Ibid.*, p. 117. [72] *Ibid.*, p. 118. [73] *Ibid.*

[74] *Ibid.*, p. 117. [75] *Ibid.*, p. 120. [76] *Ibid.*, p. 121. [77] *Ibid.*, pp. 121-122.

[78] J. H. Kanner and A. J. Rosenstein, "Television in Army Training: Color vs. Black and White," *Audio-Visual Communication Review*, VIII (November-December, 1960), 247.

[79] *Ibid.*, p. 245. [80] *Ibid.*, p. 246.

[81] A. J. Rosenstein and J. H. Kanner, "Television and Army Training: Color vs. Black and White," *Audio-Visual Communications Review*, IX (January-February, 1961), 47.

[82] *Ibid.*, p. 48.

[83] Kanner and Rosenstein, *loc. cit.*, p. 252.

Grossman and his associates used three successive classes of junior students in clinical endodontics and root resection at the University of Pennsylvania Dental School.[86] Each class was divided into four informally randomized groups of about thirty students each. Group I received chairside demonstrations. This group, in turn, was composed of four subgroups—each receiving separate demonstrations. Group II, as a unit, received demonstrations in the television studio. This group could either observe the screen or the demonstrator. Group III, also as a unit, was in a television reception room, however. Group IV received neither chairside nor television demonstrations.[87] Grossman's report was an informal one and did not clearly specify how many lessons were involved. It is further difficult to tell from the report how much practical work was involved and also how many students carried out practical assignments. Pre-tests and written post-test examinations were given three to four weeks after each demonstration.[88] A final examination was also given.[89] Grossman concluded that there were no significant differences among the sets of four groups, each successive junior year.[90]

In an Office of Education sponsored study appearing in 1962, Myers examined the influence of experienced and inexperienced television teachers.[91] An experienced and an inexperienced teacher each taught a conventional as well as a television four-lesson class, Introduction to Television and Radio. Each of the four classes was rotated through each treatment.[92] Myers concluded that experienced and substitute teachers were equally effective in presenting a lecture for immediate retention by either conventional or television means.[93]

In 1962 Neidt and French reported on the attitudes of high school students toward television.[94] An English and a geometry class were each taught by a conventional means and via a combination of correspondence-television means.[95] Both the English and the geometry teacher were used for each treatment.[96] Neidt and French concluded that students preferred the conventional to the correspondence-television class and that the most influential factor contributing to unfavorable attitudes was the lack of interpersonal communication between students and teacher.[97]

In 1962 Alexander reported in a doctoral dissertation on an experiment in the teaching of college mathematics by television at George Peabody College for Teachers.[98] In his experimental classes part of the class was taught via live television. Then one of the experimental classes was taught conventionally by a television teacher, while the other experimental class was taught conventionally, also by a new teacher. In his control class Alexander used the same pattern except that conventional classroom instruction was given in place of television. All classes lasted one academic quarter. Alexander concluded that a different teacher does not significantly alter the achievement in comparison with the class taught with the same teacher either in the conventional or television class.

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[84] F. L. McGuire, F. J. Moore, C. A. Harrison and R. E. Riley, "The Efficiency of Television as Applied to the Use of Laboratory Demonstration in Teaching," *Journal of Medical Education*, XXXVI (June, 1961), 715-716.

[85] *Ibid.*, p. 716.

[86] L. I. Grossman, I. I. Ship, and M. T. Romano, "Evaluation of Teaching by Television versus Chairside Demonstration," *Journal of Dental Education*, XXV (December, 1961), 332.

[87] *Ibid.*, p. 331. [88] *Ibid.*, p. 332. [89] *Ibid.*, p. 332. [90] *Ibid.*, p. 334.

[91] Lawrence Myers, *Evaluation of Television as a Teaching Tool by Experienced Teachers* (Syracuse, N.Y.: Syracuse University, 1961).

[92] *Ibid.*, p. 9. [93] *Ibid.*, p. 37.

[94] C. O. Neidt and J. L. French, "Reaction of High School Students to Television Teachers," *Journal of Genetic Psychology*, C (March, 1962), 337-344.

[95] *Ibid.*, p. 337. [96] *Ibid.* [97] *Ibid.*, p. 343.

In 1962 Diamond reported on a study conducted at San Jose State College for a doctoral dissertation at the School of Education, New York University.[99] This study specified the use of television as a magnifier in the laboratory phase of a Functional Human Anatomy course. He compared a conventional and television class; his main concern was comparative achievement.[100] The criterion for grades was ability to identify parts.[101] The course was one semester long and students performed demonstrations along with the demonstrator where possible.[102] The material in the course offered varying opportunities for this form of student participation. An important aspect of this study was that the teacher and the television equipment were *both* in the laboratory.[103]

Diamond found that both classes achieved similar grades on three unit tests and on the final laboratory examination.[104] In the test on one unit—skeletal parts—that offered maximum opportunity for student participation, low television students had superior achievement to low conventional students.[105] On the final laboratory examination the conventional high ability students did significantly better than the television high ability students.[106]

Williams, also in a doctoral study at George Peabody College for Teachers, was concerned, as Alexander was previously, with examining a combination of different methods of combining television and conventional instruction.[107] Williams used three groups of high school mathematics students for three weeks of classwork. One group was taught completely via television. A second group was taught partly via television but all questions were handled by a conventional classroom instructor after the television work was over. A third group had the same television instruction as the first and second groups but conventional classroom instruction was concerned not only with answering questions but with providing supplementary material and giving new approaches. Alexander found no significant differences in achievement between his groups. He found no significant differences between the mean grades of high ability students among his groups and no significant differences between the mean grades of low ability students.

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[98] F. D. Alexander, "An Experiment in Teaching Mathematics at the College Level by Closed-Circuit Television" (unpublished Ph.D. dissertation, George Peabody College for Teachers, Nashville, Tennessee, 1961); Abstract, *Dissertation Abstracts,* XXII, No. 8 (1962), 2805.

[99] Robert Mach Diamond, "The Effect of Closed-Circuit Resource Television upon Achievement in the Laboratory Phase of a Functional Human Anatomy Course" (unpublished Ph.D. disseration, New York University, 1962).

[100] *Ibid.*, p. 64. [101] *Ibid.* [102] *Ibid.*, p. 66. [103] *Ibid.*, p. 65. [104] *Ibid.*, p. 67.

[105] *Ibid.*, p. 69. [106] *Ibid.*, p. 47.

[107] H. E. Williams, "A Study of the Effectiveness of Classroom Teaching Techniques Following a Closed-Circuit Television Presentation in Mathematics" (unpublished Ph.D. dissertation, George Peabody College for Teachers, Nashville, Tennessee, 1962); Abstract, *Dissertation Abstracts,* 23:2160, No. 6, 1962.

Wohlgamuth, in a study sponsored by the Office of Education, focused on examining the differences between several kinds of student responses to five one-hour television taught lessons—"student-teacher feedback," as it was called.[108] Group I had no feedback. Group II was the vicarious feedback group. They observed a television studio-class that did use feedback. Group III used feedback through a class microphone. Group IV used a pushbutton feedback system that contained different prerecorded types of response. Wohlgamuth found no statistically significant differences in learning or retention by any feedback method. Nor did he find that different feedback systems significantly affected attitude toward television instruction.

In 1962 and after the present experiment was completed, Grant and his associates at the School of Dentistry at the University of California, San Francisco, under a grant from the Office of Education, compared the achievement between a conventional and television class for one technic in Crown and Bridge Prosthetics.[109] The conventional class was taught via a classroom lecture with slides while the television class saw a demonstration.[110] Grant was not interested in attitude or in written work. Thirty specially selected students were used for each class. They were ranked in each class on the basis of previous crown and bridge grades to give a top, middle and low ability trichotomy.[111] Grading was done by scoring the students' practical preparation.[112] A statistical test demonstrated that the scoring procedure itself was reliable.[113] The same instructor taught both classes and scored student work.[114] Because of difficulties during the experiment—the television demonstration was judged to be inferior to the conventional presentation—the conclusions cannot be accepted at face value.[115] But a statistical test showed that it was possible to accept the null hypothesis for a difference between conventional and television teaching.[116]

In 1964 Crandell and Bryson reported on the teaching of dental roentgenology at the University of North Carolina School of Dentistry.[117] A class of fourteen dental hygiene students was divided into two groups.[118] The classes were equated on previous scholastic average.[119] One group received television instruction exclusively.[120] The other group received conventional instruction in the television studio itself but without use of television equipment.[121] Both groups received one semester of instruction which covered the making of intra-oral films.[122] Evaluation of student learning was based on a one-hour objective written examination, five practical performance examinations, and the instructor's subjective evaluation.[123]

Crandell and Bryson concluded that the television class did better on lecture material while the conventional class (held in the television studio but without use of television equipment) did better on laboratory clinical material, but that the differences were not significant.[124] At the same time the final grades, combining the several measures of student achievement, were almost identical. Crandell and Bryson, in reviewing the literature, noted briefly that in 1956 Tannenbaum compared televised lecture-demonstration teaching of postgraduate periodontology to dentists in six states with conventional teaching that relied on a manual and found that television was highly effective in comparison with conventional teaching.

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[108] D. Wohlgamuth, "A Comparative Study of Three Techniques of Student Feedback in Television Teaching," Abstract, *Audio-Visual Communication Review*, X A-100 (May-June, 1962).

[109] T. S. Grant, R. L. Blancheri, S. F. Lorencki, and I. R. Merrill, "Television in Health Sciences: I. Effectiveness of Television within the Dental Laboratory," *Journal of Dental Education*, XXVI (June, 1962), 146-151.

[110] *Ibid.*, p. 147. [111] *Ibid.*, p. 148. [112] *Ibid.* [113] *Ibid.* [114] *Ibid.*, p. 147.
[115] *Ibid.* [116] *Ibid.*, p. 151.

[117] C. E. Crandall and J. E. Bryson, "An Evaluation of Television as a Method of Teaching Dental Roentgenology," *Journal of Dental Education*, XXVIII (March, 1964), 37-42.

[118] *Ibid.*, p. 39. [119] *Ibid.* [120] *Ibid.*, p. 40. [121] *Ibid.*, p. 39. [122] *Ibid.*, p. 40.
[123] *Ibid.*

In sum, prior to the start of this experiment no study concerned itself with the teaching of difficult digital skills of increasing complexity for a full academic year via television. After plans for this study were underway, during the course of the experiment itself and afterwards, reports of several studies appeared that touched on various aspects of this experiment: color versus black-and-white film; different methods of student-teacher feedback; different combinations of television and conventional class instruction; television as a laboratory magnifier; televised undergraduate science laboratory instruction; in fact, one study concerned itself with the teaching of one dental technic and used a very similar experimental form. But the essential focus and concern of this study—televised dental laboratory instruction for a full academic year—has not been examined in print prior to this study or concurrently with it.

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[124] *Ibid.*, p. 41.

Chapter III

SUBJECTS, MATERIALS AND PROCEDURES

THE PLAN OF THE COURSE

The Content of the Course

Sophomore Operative Dentistry at the College of Dentistry, New York University, at the time of this study, was a pre-clinical course designed to prepare students for clinical operative dentistry—for work with patients—in their junior and senior years. This course, which ran for an entire academic year of three trimesters, was described in the 1959-1960 College of Dentistry Bulletin as follows:

> The course presents all types of odontoplastic operations which are performed by the student on a special manikin with removable jaws containing articulated natural teeth. This system enables the student to become familiar with the various operating positions, assume proper rests, guards, and finger positions, and to operate under conditions resembling those in the human mouth.
>
> The following subjects are taught: anatomical, histological, and physiological considerations in operative dentistry; introduction to the subject of dental caries and oral health; preventive measures; instruments and fundamental mechanical principles applied to instrumentation; special emphasis is laid on supervised and systematized digitation; chair and operative positions, cavity preparation and the underlying engineering principles; study of the physiochemical properties that govern the manipulation of filling materials. The most recent developments in operative dentistry, utilizing cooling devices automatically controlled, higher speeds, and tungsten carbide burrs and diamond tools, are employed in manikin jaw procedures. . . .[1]

Course Schedule

The course was scheduled as follows:

1. The entire class, 170 students, attended an operative lecture from 8:30 to 9:20 each Monday morning in order to introduce the class to the work for the week. This lecture, stressing theory and practical concepts, was given in a lecture hall.
2. Because the pre-clinical operative dental laboratory accommodated eighty-five students, this class of 170 sophomores was divided into two sections for laboratory purposes—each section meeting twice a week. Section A met Monday and Wednesday mornings from 9:30 to 12:15. Section B met Monday afternoon from 1:15 to 4:00 and Friday morning from 9:30 to 12:15. Normally, the day and hour schedule for both sections was constant for three trimesters.

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[1] *New York University Bulletin,* LIX (June 1, 1959), 45.

Laboratory Facilities

The physical arrangement of the laboratory and the dimensions of a student's work space are shown in Figures 1 through 6.

Instructional Staff and Method of Teaching

Prior to the experimental year of 1960-1961, the instructional staff for this course was composed of one Lecturer, the faculty member responsible for the course, who gave the Monday morning lecture as well as an additional lecture in the laboratory, and four Laboratory Instructors. The Lecturer had been employed in the department for thirty-one years. The four Laboratory Instructors had been employed in the department for twenty-four, sixteen, eight and four years each.

The laboratory sections were usually conducted in the following manner: at the start of the laboratory meeting, a lecture was presented from the platform (Figure 2) by the Lecturer on the particular technic for the week. This lecture in the laboratory, in contradistinction to the Monday morning lecture, stressed detail and practical delineation. Usually, the Lecturer used a microphone installed at his platform. The microphone fed into eight speakers (Figure 1). Following the laboratory lecture, each of the four Laboratory Instructors illustrated the technic on a manikin jaw to groups of about ten students at a student desk; each Laboratory Instructor, in sum, gave two demonstrations to a total of about twenty students. The Lecturer did not perform any manikin demonstrations, except in an emergency.

Following the small-group demonstration, each student repaired to his own desk and

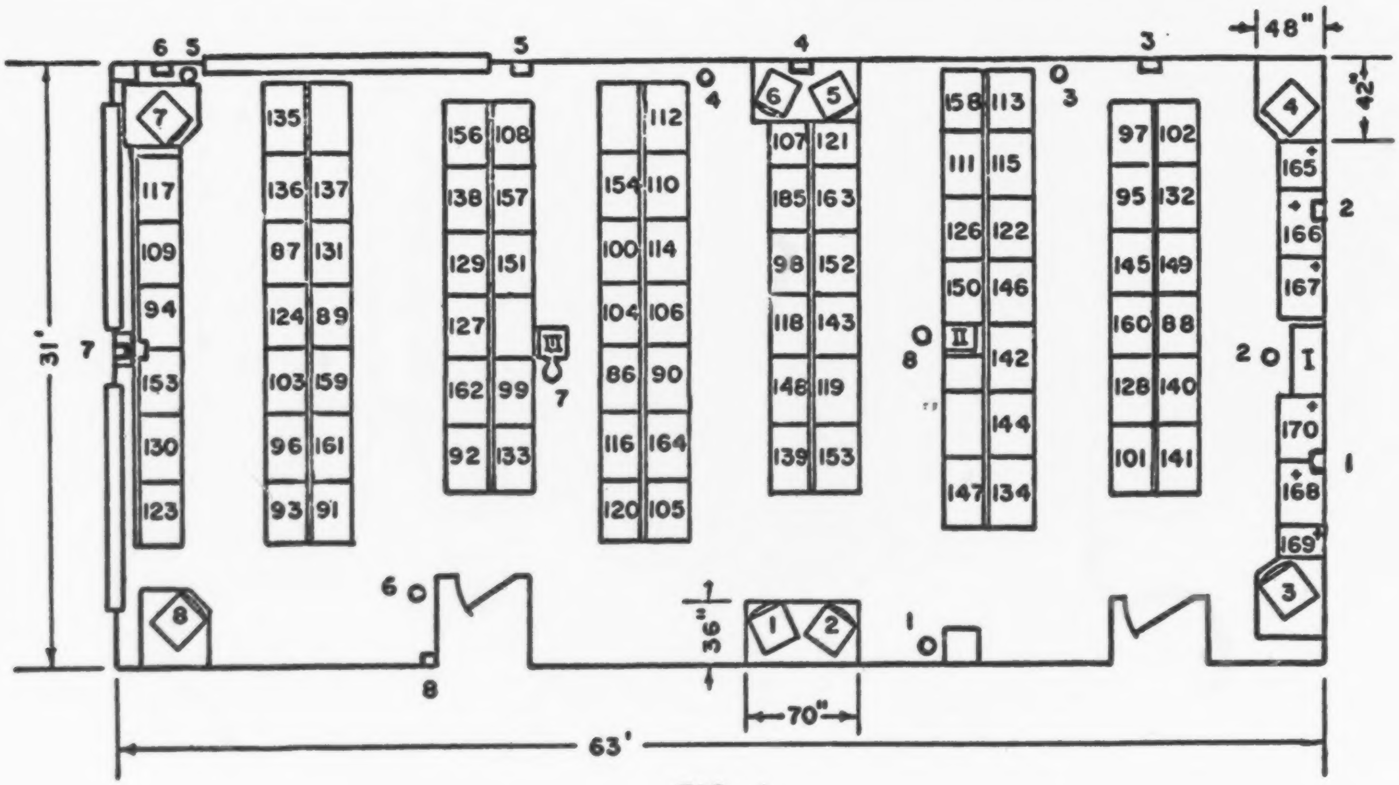

48"
42"
31'
36"
70"
63'
117
109
94
153
130
123
135
136
137
87
131
124
89
103
159
96
161
93
91
156
108
138
157
129
151
127
162
99
92
133
112
154
110
100
114
104
106
86
90
116
164
120
105
107
121
185
163
98
152
118
143
146
119
139
153
158
113
111
115
126
122
150
146
142
144
147
134
97
102
95
132
145
149
160
88
128
140
101
141
165
166
167
170
168
169

FIG. I

OPERATIVE TECHNIC LABORATORY

Floor plan – T.V. group student identification numbers

● microphones ▭ speakers ☐ T.V. sets ▣ posts + repeat and foreign students

scale: .12" = 1 foot

carried out his assignment. Each technic was broken down into steps and, normally, each student had each step checked off (graded and approved) before continuing to the next step. There was no pattern of assignment of Laboratory Instructors to students for checking off work. A student's work was checked off by any available Laboratory Instructor.

In the normal course of events, each Laboratory Instructor performed instructional duties in addition to the initial demonstration and grading—answering questions, doing additional demonstrations either for an individual student or for small groups when necessary, et cetera.

In sum, the teaching of the course was divided as follows: (1) Monday morning lecture, (2) laboratory lecture, (3) laboratory demonstration, (4) additional laboratory instructions, and (5) laboratory check-off.

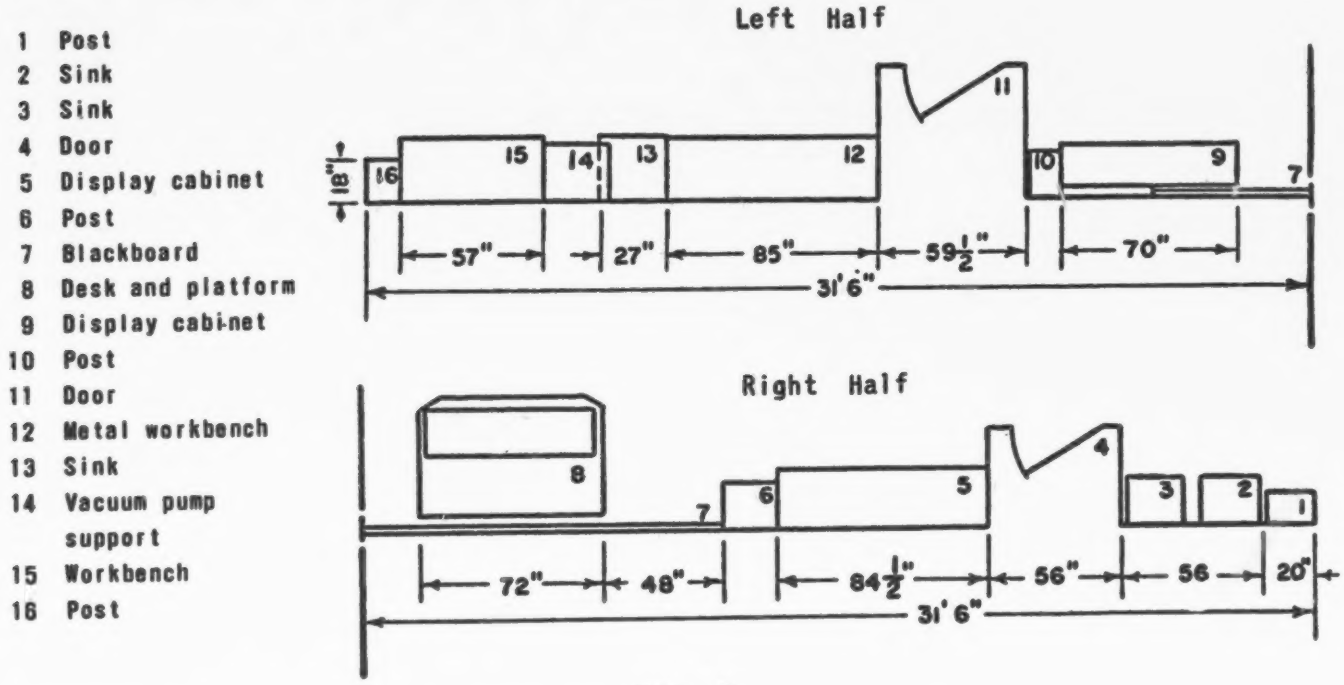
Seating

Students were permitted to choose their own desks in the laboratory. This held for all students except for foreign and repeat students. The seating arrangement was kept for the entire academic year. The seats assigned foreign and repeat students are shown in Figures 1 and 3, pages 16 and 18.

Grading

Two types of grades were given: the written and the practical. The written grade was determined by means of a written examination—usually essay—given at the end of each trimester. The practical grade was determined in the manner previously described, i.e., a Laboratory Instructor graded each practical preparation step-by-step as the student worked on the assigned project. A trimester practical grade was a weighted average of the grades for all of the practical preparations of that trimester.

Each student received a trimester grade which was a composite of the trimester written



1 Post
2 Sink
3 Sink
4 Door
5 Display cabinet
6 Post
7 Blackboard
8 Desk and platform
9 Display cabinet
10 Post
11 Door
12 Metal workbench
13 Sink
14 Vacuum pump support
15 Workbench
16 Post
Left Half
18"
57"
27"
85"
59½"
70"
31'6"
Right Half
72"
48"
84½"
56"
56
20"
31'6"

FIG. 2

OPERATIVE TECHNIC LABORATORY — FLOOR PLAN

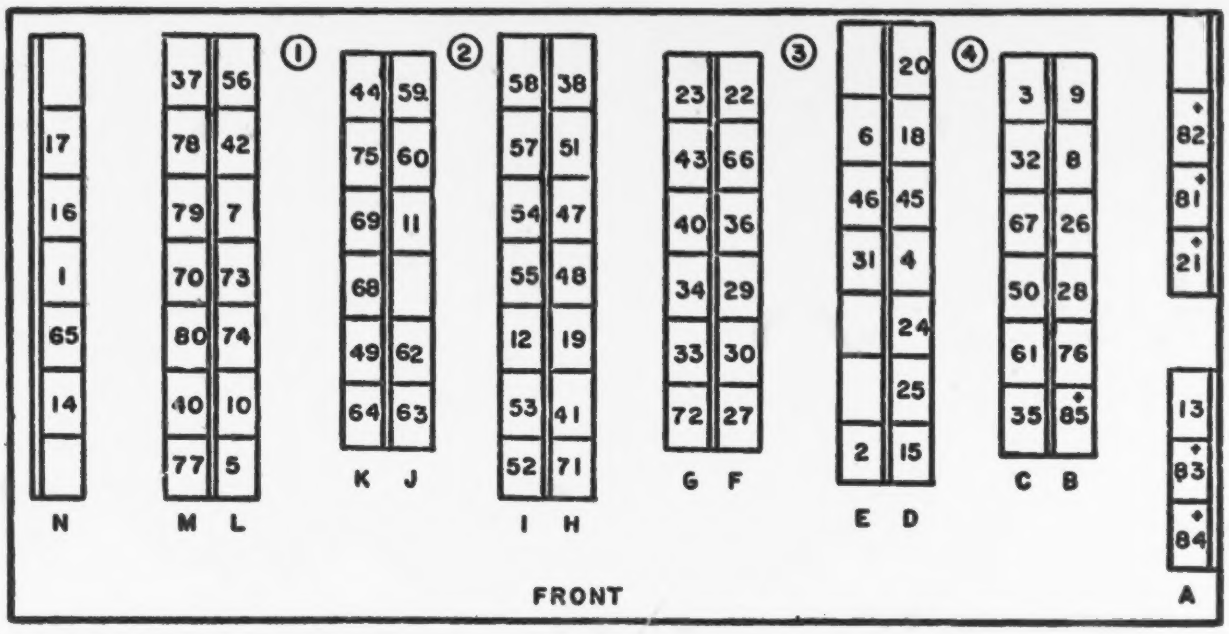
Front wall detail from Fig. 1 Scale: $\frac{12}{64}$" = 1 foot and trimester practical grade. The final grade for the academic year was, in turn, a composite of these three trimester grades.

THE PLAN OF THE EXPERIMENT

Speaking broadly, the purpose of this study was to compare experimentally a conventional, or non-television, class and a television class in terms of grades and attitudes. The detailed plan for accomplishing the above purpose had to meet, of course, the criteria for sound experimental design. One such criterion is that the experimental procedures should not themselves become an important independent variable that biases the subjects' behavior. In the present study, for example, it was thought that the students would be interested and cooperative provided that the extra time required of them was not excessive, and provided that the experimental procedures did not interfere with their main objective, which was to learn about operative dentistry. Likewise, the opinions of the participating teachers had to be taken into account. The teachers objected to several details in the original research proposal because of fears that the quality of instruction might be adversely affected. All of these objections were carefully discussed and several details were modified in order to insure the full cooperation of the teachers.

There were no serious questions regarding the conventional (control) class. That half of the 1960-1961 class was taught in the customary pre-television way which is described in the preceding section of this chapter.

The procedures used in the television (experimental) class were planned so as to hold all



①
②
③
④
N
17
16
1
65
14
M
37
78
79
70
80
40
77
L
56
42
7
73
74
10
5
K
44
75
69
68
49
64
J
59
60
11
62
63
I
58
57
54
55
12
53
52
H
38
51
47
48
19
41
71
G
23
43
40
34
33
72
F
22
66
36
29
30
27
E
6
46
31
2
D
20
18
45
4
24
25
15
C
3
32
67
50
61
35
B
9
8
26
28
76
+85
A
+82
+81
+21
13
+83
+84
FRONT

FIG. 3

OPERATIVE TECHNIC LABORATORY

Conventional group — Student identification seating numbers

+ Repeat and foreign students
A-N Rows
① Judge locations

non-relevant variables constant (i.e., the same as in the control class). The independent experimental variable—teaching by television—might have been manipulated in any of several possible ways. The final choice is described immediately below. Thus the first and second sections of this chapter permit direct comparisons between the techniques and procedures used in the conventional (control) class and those used in the television (experimental) class.

The Content of the Course

The content of the course in Sophomore Operative Dentistry, as taught in 1960-1961, the year of the experiment, was unchanged from that prior to television teaching, as described in the first section of this chapter. The purpose of the course also remained the same.

Course Schedule

The over-all class schedule for pre-television teaching, as described in the first section, was maintained during the year of experimental inquiry, 1960-1961.

The usual division of the Sophomore class into two laboratory sections corresponded with the research need for a control group—conventional (hereafter identified as "the CV class") and an experimental group—television (hereafter identified as "the TV class"); both sections were taught by the same staff.

During Trimesters I and II, 1960-1961, Laboratory Section A, meeting Monday morning and Wednesday morning, was the CV class and Laboratory Section B, meeting Monday afternoon and Friday morning, was the TV class. During Trimester III, 1960-1961, the meeting

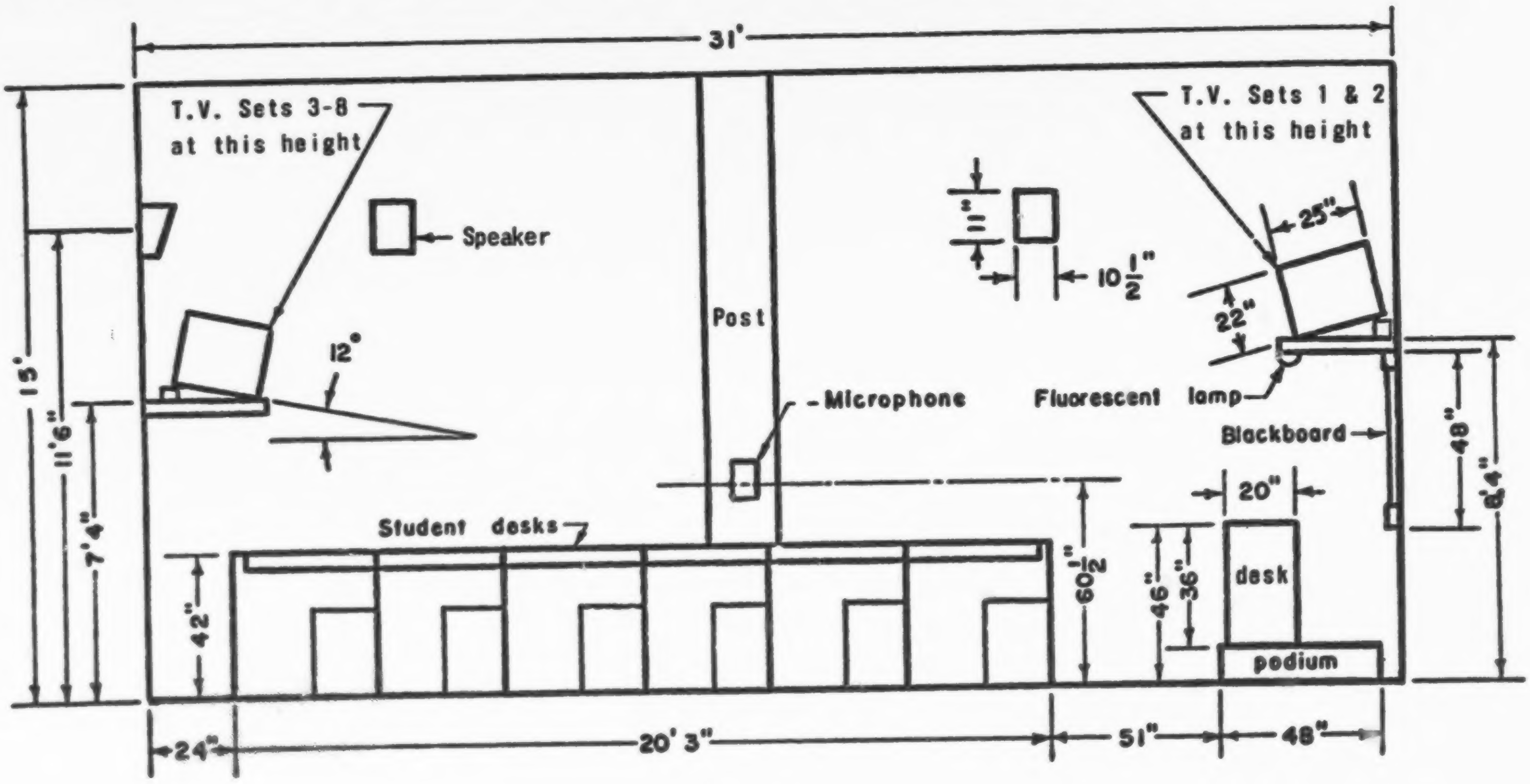

31'
T.V. Sets 3-8 at this height
Speaker
12°
Post
- Microphone
T.V. Sets 1 & 2 at this height
25"
22"
11"
10 1/2"
Fluorescent lamp
Blackboard
20"
desk
podium
Student desks
15'
11'6"
7'4"
42"
60 1/2"
46"
36"
48"
8'4"
24"
20' 3"
51"
48"

FIG. 4

OPERATIVE TECHNIC LABORATORY

Transverse section between rows G and H viewing toward right wall
For full details see Fig. 1. Scale: $\frac{1}{4}$" = 1 foot

times for Sections A and B were reversed, so that Section A (the CV class) now received instruction Monday afternoon and Friday morning and Section B, which previously received TV instruction Monday afternoon and Friday morning, now received TV instruction Monday morning and Wednesday morning.

Laboratory Facilities

No basic change was made in the laboratory for TV teaching except for the installation of TV receivers and a talk-back circuit to the TV studio. This equipment is shown in Figures 1 and 4, pages 16 and 19. In fact, the speakers that were used by the Lecturer for his laboratory lecture prior to the introduction of TV teaching in 1960-1961 also carried the audio circuit coming from the TV studio for TV teaching. The location of these eight speakers may be seen in Figures 1 and 4, pages 16 and 19. Figure 7 shows the plan of the TV studio.

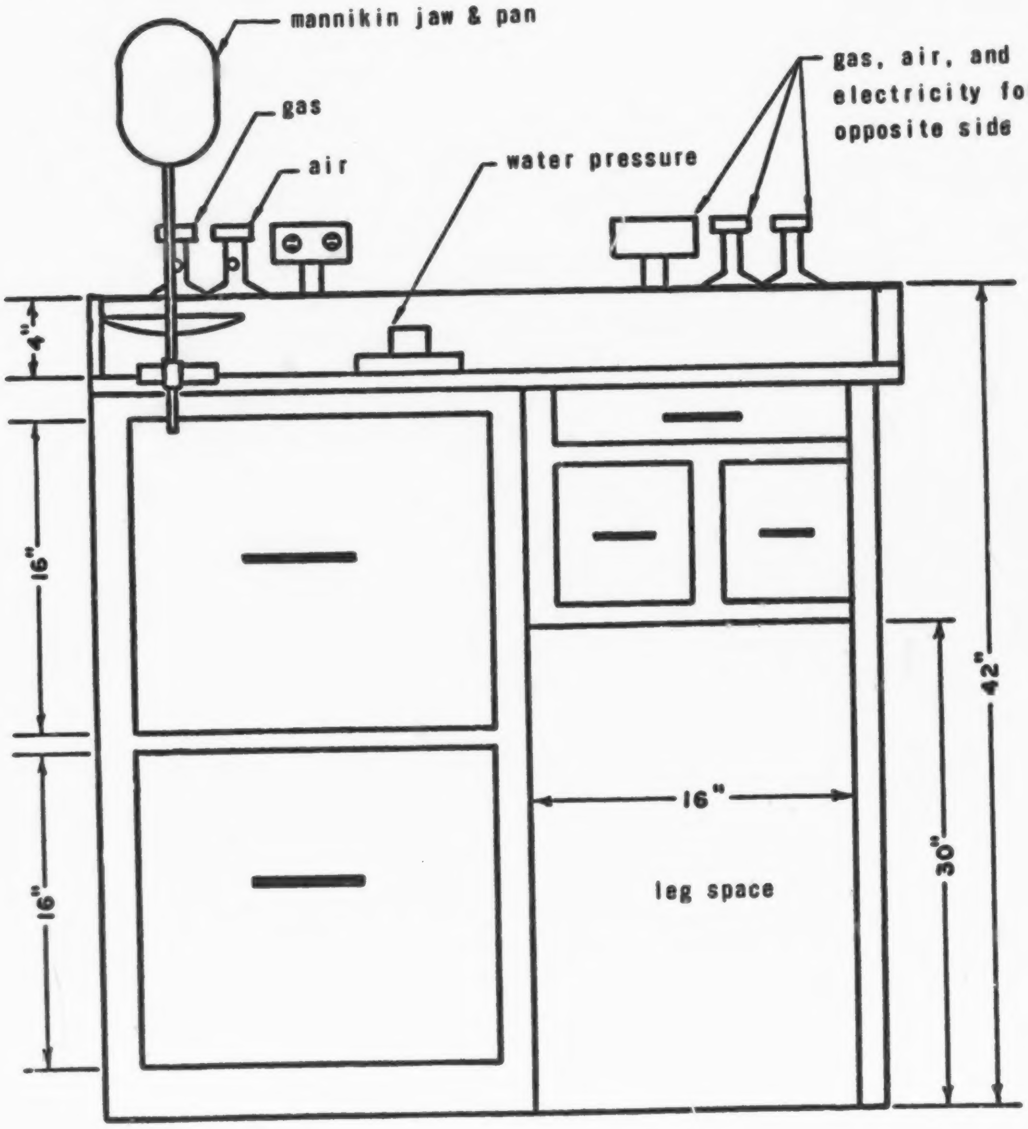

mannikin jaw & pan
gas
air
water pressure
gas, air, and electricity for opposite side
4"
16"
16"
16"
leg space
30"
42"

FIG. 5

OPERATIVE TECHNIC LABORATORY

Front View — Student Desk

Scale: $\frac{1}{8}$" = 1 inch

During the year of the experiment, then, both CV and TV classes heard the Lecturer over the same eight speakers.

Instructional Staff and Method of Teaching

No changes were made for the purposes of this study from the teaching faculty as described in the first section of this chapter.

The production staff for the TV programs was composed of the teaching faculty. A television engineer was employed but his work was confined to equipment maintenance and operation of controls. An additional faculty member of the Department of Operative Dentistry, but not of the teaching staff for this particular course (Sophomore Operative Dentistry), served as Director in the control room when the teaching or, rather, teaching-production staff was short-handed.

Monday morning lecture.—The Monday morning lecture for 170 students, as described on page 15, could not be divided into halves with each half receiving a different type of instruction; it could not be manipulated for the purposes of this study.

The effect of this combined non-television lecture on the results of this study is discussed later in the text.

Laboratory lecture and laboratory demonstration.—

1. Conventional class: The CV class maintained the same type of laboratory lecture and laboratory demonstration instruction described in the first section of this chapter. Thus, for all three trimesters *no* laboratory demonstration work came over TV.

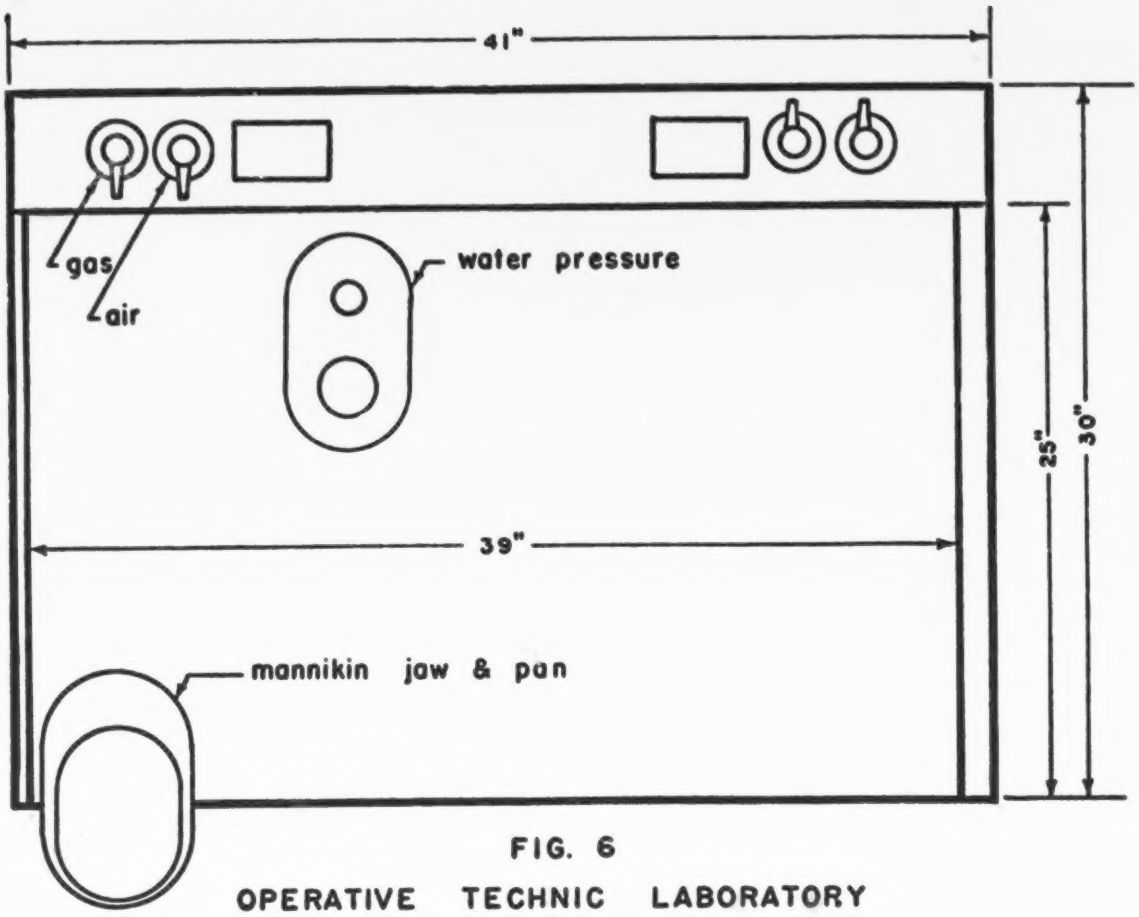


FIG. 6
OPERATIVE TECHNIC LABORATORY
Top View — Student Desk
Scale: 16" = 1 inch

2. Television class: Each trimester, the experimental class—the TV section—had a different television-teaching format. During Trimester I, the laboratory lecture and the laboratory demonstration *both* came over television. During Trimester II, the Lecturer delivered his lecture material from the platform in the laboratory (as in CV instruction—see Figure 2, page 17) but the laboratory demonstration came over television. During Trimester III, half of the TV programs followed the format of Trimester I and half followed the format of Trimester II. For *all* three trimesters, however, *all* laboratory demonstration work came over TV. These formats are summarized as follows:

	Trimester		
	I	*II*	*III*
Laboratory Lecture	TV	Classroom	1/2 Classroom 1/2 TV
Laboratory Demonstration	TV	TV	TV

All of the visual material that was used in the CV class—movies, slides, Vu-graph, blackboard—was used via TV. Color slides appeared as black-and-white over TV. On occasion, the Lecturer used oversize models in the CV class. But these, understandably, were not used over TV. The number of lessons televised differed from trimester to trimester. This is shown in the following figures:

Trimester	*Number of TV Lessons*
I	16
II	10
III	7

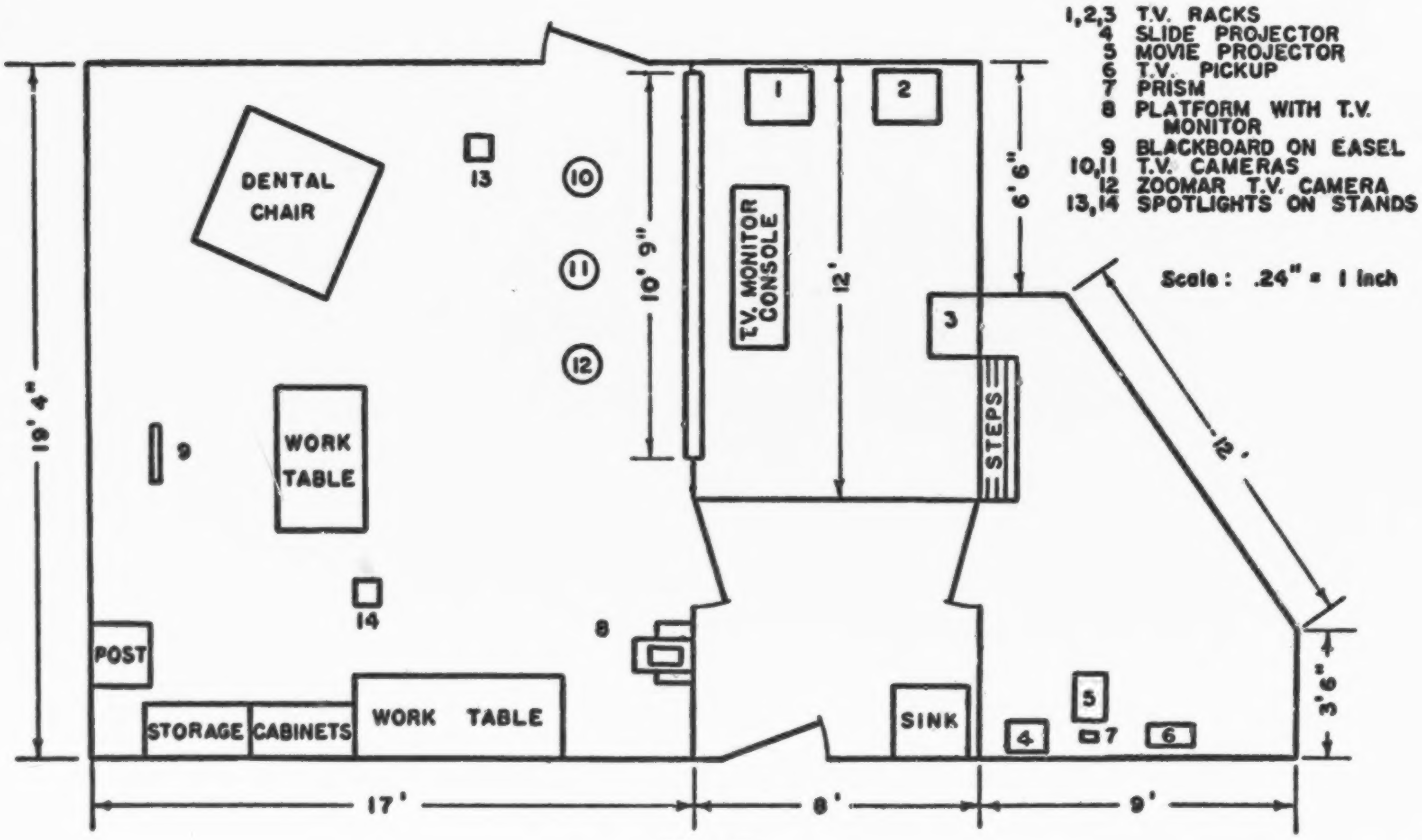

1,2,3 T.V. RACKS
4 SLIDE PROJECTOR
5 MOVIE PROJECTOR
6 T.V. PICKUP
7 PRISM
8 PLATFORM WITH T.V. MONITOR
9 BLACKBOARD ON EASEL
10,11 T.V. CAMERAS
12 ZOOMAR T.V. CAMERA
13,14 SPOTLIGHTS ON STANDS
Scale: .24" = 1 inch
DENTAL CHAIR
WORK TABLE
POST
STORAGE
CABINETS
WORK TABLE
T.V. MONITOR CONSOLE
STEPS
SINK
1
2
3
4
5
6
7
8
9
10
11
12
13
14
19' 4"
10' 9"
12'
6' 6"
12'
3' 6"
17'
8'
9'

FIG. 7
TV STUDIO FLOOR PLAN

The titles of these TV lessons are listed in Appendix A. One of the Laboratory Instructors was always present in the laboratory during a TV production. He served as a monitor; in addition, he checked TV reception and voice level. During *both* CV and TV instruction, questions from the class were permitted only at designated times. At such times, in the TV section students went to the closest microphone (see Figure 1, page 16) after receiving permission from the monitor, and spoke with the Lecturer in the TV studio. The answer came back via TV.

A script was prepared for each TV lesson. One of these scripts is reproduced in Appendix B.

Laboratory check-off.—For the purposes of the study during 1960-1961, each of the classes—CV and TV—was divided into quarters on the basis of seating arrangement. For any given practical preparation, an assigned Laboratory Instructor graded the practical work of that sub-group. These assignments of Laboratory Instructor to sub-groups rotated consecutively. Rows A, B, C and D were sub-group 1; et cetera. These rows are indicated in Figure 3, page 18.

Additional laboratory instruction.—The additional instructional work of the Laboratory Instructors, after their small group demonstration work, as described in section one of this chapter, was the same in both CV and TV classes and was unchanged from the previous year, 1959-1960, except for the restriction on rotation of Laboratory Instructors and sub-groups.

In order to focus on the *initial demonstration* work of the Laboratory Instructors, for the purposes of the attitude scales (to be described under the heading "Teacher Rating Scale" in this chapter), and to separate this *initial demonstration* activity from all other instructional work of the Laboratory Instructors, the title *Laboratory Demonstrator* was chosen for them. This term also served to set off the work of the Laboratory *Lecturer.* The term *Laboratory,* in turn, distinguished the foregoing teaching activities from the Monday morning lecture.

Seating

During the year of this study, 1960-1961, no change was made in the system used in previous years allowing students to choose their own desks. Figures 1 and 3, pages 16 and 18, give the seating arrangement of the TV and CV classes, respectively; in the diagrams each student desk has the student identification number.

Grading

During the year of this study, 1960-1961, the CV and TV students took the same written examinations. Likewise, the practical work in both groups was graded in accordance with a single set of standards.

Grading procedures for 1960-1961 differed, however, from those of previous years. The section "Written Examinations" will describe the construction of written examinations used in 1960-1961. The section "Practical Grading Criteria" will describe the revised system of practical grading instituted for 1960-1961.

SUBJECTS

In order to compare CV and TV teaching, two classes were created—one was taught via TV and the other was taught in the same way as in previous years (CV).

The total enrollment of the course was 170. This was, also, the total Sophomore class enrollment for 1960-1961. Eleven of these 170 students were either foreign or repeat students. They were automatically eliminated from data analysis, but not from data collection; they were not advised of this procedure. Figures 1 and 3, pages 16 and 18, show the desks of the repeat and foreign students. There were no women students.

With the exception of the foreign and repeat students, all sophomores came directly from undergraduate school and entered as freshmen. For these 159 students this was the second dental school year.

In order to create the control and experimental classes, data were collected from the sophomore class of 1959-1960—the year prior to the one under study. These data covered grades and a variety of aptitude scores. The CV and TV classes for 1960-1961 were created by use of these grades and scores for 1959-1960. Seventy-seven students were selected for each class in 1960-1961—a total of 154. The remainder of this section describes the procedures used in constructing classes.

Using grades and aptitude scores for the 1959-1960 class, two multiple correlation equations were developed to predict the following two dependent variables in Sophomore Operative Dentistry:

1. Composite written grade: This score was the sum of the final written objective examination for Trimester II and that for Trimester III. The score for the Trimester I examination was not used.[2]
2. Composite practical grade: This was the sum of the practical grades for Trimesters II and III, 1959-1960. During Trimester II, the following six practicals were used to create a composite practical grade:

1. $\overline{6}|$ amalgam insertion
2. $\overline{4}|$ DO amalgam insertion
3. $|\overline{6}$ MOD amalgam insertion
4. $\underline{6}|$ DOL amalgam insertion
5. Class I Gold Foil $\underline{6}|$ occ.
6. Class III preparation $\underline{1}|$ M.

During Trimester III, 1959-1960, the following five practicals were used to create a composite practical grade:

1. $\overline{6}|$ polish amalgam
2. $\underline{2}|$ M
3. $|\underline{1}$ M
4. Carious Molar
5. $\overline{6}|$ M.O.D.B.

The following set of ten independent variables was used to predict each of the two dependent variables (above). The independent variables were derived from two sources: previous grades, and scores on the American Dental Association Aptitude Tests.

---

[2] The written examination for Trimester I, 1959-1960, had an essay format.

Previous grades:

1. Undergraduate grade point average (UGPA)
2. Average of grades in two freshman practical dental courses:
    a. Denture Prosthesis
    b. Dental Anatomy—Technic
3. Dental Anatomy—Didactic[3]
4. Composite of four freshman dental grades:
    a. Gross Anatomy
    b. Biochemistry
    c. Histology
    d. Microbiology

American Dental Association Aptitude Tests:

5. ACE "Q" Reasoning
6. ACE "L" Reasoning
7. ACE Mental Level—Reading Comprehension
8. Total Science Score
9. Space Relations
10. Carving Dexterity

The multiple correlations for the two dependent variables were:

1. Written Composite——.53
2. Practical Composite——.56

The regression coefficients for the ten independent variables for each of the two equations are presented in Table 1.

Inspection of the regression weightings shown in Table 1 indicated that several of the ten tests contributed little or nothing to the prediction of grades in Sophomore Operative Dentistry. The undergraduate grade point average (UGPA) was, not unexpectedly, the best predictor of the written grade; likewise, freshman practical grades were the most useful predictors of sophomore practical grades. The findings relative to "carving dexterity" were of interest because of the unusual nature of the test—subjects were requested to carve designated figures from bars of soap. This seemed to be an ingenious test for prospective dentists; but the grading of the soap carvings involved a large element of subjective judgment. Table 1 shows that carving dexterity was negatively related to written grades, yet it was a fairly good predictor of practical grades.

Using these two regression equations, two scores were predicted for each student in Sophomore Operative Dentistry, 1960-1961. The 1960-1961 students were then divided into control (CV) and experimental (TV) classes.

---

[3] Dental Anatomy—Technic and Dental Anatomy—Didactic are two grades given in one course. These two grades represent, as the name implies, two different aspects of class work.

Table 1

REGRESSION COEFFICIENTS OF TEN INDEPENDENT VARIABLES FOR TWO PREDICTED GRADES: SOPHOMORE CLASS 1959-1960

Independent Variable	Composite Written Grade	Composite Practical Grade
1. UGPA	2.077	-.485
2. Two Practical freshman grades	.920	1.881
3. Dental Anatomy—Didactic	.419	.508
4. Four freshman dental grades	.151	.093
American Dental Association Aptitude Tests		
5. ACE "Q"	.118	-.304
6. ACE "L"	.044	-.512
7. ACE mental level	-.026	.269
8. Science score	.204	-.122
9. Space relations	.002	.144
10. Carving Dexterity	-.192	.349
Constant	-30.681	-65.141
R.	.53	.56

Table 2 presents the means, standard deviations, and *t*'s for these two classes on the two predicted variables. Appendix C lists the predicted written and predicted practical grades for each student in the CV and TV classes.

Examination of the *t* test data for the difference between means for each of the two variables (Table 2) shows that the CV and TV classes were probably not distinguishable on practical work. However, the CV classes had a statistically significant lead over the TV class ($p = < .05$) for written work. This discrepancy necessitated use of analysis of covariance.

Although the predicted efficiency of the regression equations was not as high as could have been hoped for ($R = .53, .56$), the predicted scores were used in the construction of the control and experimental classes because they offered the best available information on student aptitudes.

Table 2

The Means, Standard Deviation and t's for Two Predicted Composite Grades for Matched CV and TV Classes: Sophomore Class 1960-1961

Class		Predicted Composite	
		Written	Practical
$\bar{X}$	CV	149.63	156.26
SD	(N=77)	6.39	8.13
$\bar{X}$	TV	147.19	155.59
SD	(N=77)	5.91	8.67
t		2.47*	.49
$t_{.05} = 1.99$	$t_{.01} = 2.64$	df = 152	

*Significant at .05 level.

Written Examination

The following pretesting procedure was followed in Trimesters II and III, 1959-1960, in order to prepare the written objective examinations that were used in Trimesters II and III, 1960-1961.

The teaching staff constructed an examination of 100 items in two parallel forms for each of the two trimesters. Each trimester's examination was predominantly True-False. No attempt was made to validate these items by an external criterion.[4] The assumption was made that these were homogeneous items which measured a specific and limited segment of ability.[5] The purpose of pre-testing was limited to selection of the best item format—not best items; on an achievement test, item selection for content may not be as valuable as expert opinion.[6] Sample parallel items, taken from the examination, follow:

The following statements are true:

1. a) The larger the particles of cement powder the faster the set.
   b) The smaller the particles of cement powder the faster the set.
2. a) Cement has poor edge strength, but good tensile strength.
   b) Cement has good edge strength, but poor tensile strength.
3. a) Non-cohesive Gold Foil is made cohesive by annealing.
   b) Cohesive Gold Foil is made non-cohesive by gaseous adsorption.

No correction for guessing was used although there were two choices for an item. However, there were no omissions and items did not differ from one another in the number of mis-leads. A simple direct ratio of item difficulty was not used because this assumes a rectangular distribution of ability. The preferable assumption is one of a normally distributed variable. The Flanagan r makes two additional assumptions: (1) it assumes that there is a linear relation between item and test score—that percentage of success on an item increases as the total score increases; (2) it assumes also that the item dichotomy does not represent a real dichotomy as in the point bi-serial. Although the item dichotomy—r/w—is an efficient dichotomy, certainly those who pass or fail an item represent a range of ability with regard to an underlying function instead of two categorically distinct groups. A correction for overlap was not used.

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[4] J. P. Guilford, *Psychometric Methods* (2d ed.; New York: McGraw-Hill Book Co., Inc., 1954), p. 418.
[5] Robert L. Thorndike, *Personnel Selection* (New York: John Wiley, 1949), p. 231.
[6] Guilford, *op. cit.*, p. 418.

There are two disadvantages to the use of the Flanagan here: (1) the N's were small in the extreme groups; (2) since choice was limited to one of two items, a simpler test might have functioned as well.

From the point of view of computational ease the Flanagan r, as an item selection technique, is highly recommended.[7,8] It is one form of internal consistency analysis—each item is evaluated in terms of total test score. This technique sacrifices the continuous nature of the variable by using extreme groups.[9] Although use of extreme groups sharpens discrimination, the loss of data decreases dependability of item indices. However, Kelley has shown that the most accurate arrangement of items in terms of discrimination, assuming a willingness to sacrifice data, results from using 27 per cent of each tail.[10] Flanagan's tables provide estimates of the product-moment correlation between the item and test score—assuming both have a continuous and normal distribution—when 27 per cent of each tail is used.

After applying the Flanagan technique, the item with the higher correlation in each pair of parallel items was chosen for inclusion in the examinations to be used in 1960-1961.

The reliability of each of the two parallel forms of the written examinations in Trimesters II and III, 1959-1960, and the reliability of each of the final forms used in 1960-1961, as determined by the Kuder-Richardson formula 20[11] follows:

Trimester II		*Trimester III*	
Form A	.61	Form A	.59
Form B	.70	Form B	.73
Combined	.78	Combined	.83

In each trimester, use of item analysis produced a more homogeneous set of items.

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[7] J. C. Flanagan, "General Considerations in the Selection of Test Items and a Short Method of Estimating the Product Moment Coefficient from the Data at the Tails of the Distribution," *Journal of Educational Psychology*, XXX (December, 1939), 674-680.

[8] Truman L. Kelley, "The Selection of Upper and Lower Groups for Validation of Test Items," *Journal of Educational Psychology*, XXX (January, 1939), 17-24.

[9] Thorndike, *op. cit.*, p. 241.

[10] Kelley, *loc. cit.*, pp. 17-24.

[11] Guilford, *op. cit.*, p. 380.

In order to provide a unified grading system for the four LD's, the teaching staff constructed weighted grading check lists for each practical preparation (i.e., laboratory project). These forms were used in 1959-1960. They were distributed to each student at the start of the class and turned in by him at the close, with the point score indicated for the various phases of work. As a result of use during 1959-1960, these forms were revised by the teaching staff for use in 1960-1961. A sample of one of these final forms is shown in Appendix D.

The rotation system used by the four LD's in grading the practical work of each of the four quarters of the class has been described on page 23.

In order to examine the similarity (concordance) among the LD's in assigning grades to practical preparations the following procedure was used: (1) several samples (six to ten) of student work for one dental preparation were presented to an LD for grading in terms of the revised set of criteria used for class grading. (2) In order to provide a range of ability, an attempt was made to select several samples of excellent work, several samples of poor work, and several samples of average work. The samples were chosen by the faculty member responsible for the course from work that was submitted by the class for their regular assignment. The measure of similarity-grading took place on the day that a given assignment was due. (3) Each sample was given a number by the experimenter and the LD graded the samples in sequence, from left to right, as they were lined up on the desk in front of him. One LD was present at a time. Prior to the next demonstrator's grading, the sequence of samples was randomized and grading took place again from left to right. The dental sample code numbers on the LD grading sheet corresponded with the sequence of numbers on the dental preparations from left to right.

In sum, except for the necessities of experimental control, the measure of grading similarity on practical work imitated the regular classroom grading procedures.

The grades were then transformed into ranks and each matrix was analyzed by the Kendall Co-efficient of Concordance, which provides a measure of the extent of association of k sets of n objects.[12] Kendall's W provides a test of the null hypothesis that there are no differences among the *sums* of the ranks of objects. When the variance among the sums of ranks is maximized, the null hypothesis is rejected and the probability is that the judges are in agreement in their ranking.

Table 3 lists the coefficients of concordance (Kendall's W) for each of the ten dental preparations, and the level at which each of the W's is significant. Table 3 indicates those W's for which the null hypothesis has been rejected. Out of these ten practical preparations, the judges agreed, at acceptable probability levels, in seven cases.

Considerable assurance may be placed therefore in the similarity in the grading of the four LD's. Further protection was provided by the rotation system.

The purpose of developing the new grading system for practical work was to increase the objectivity of this type of grading. The success of the new system could be judged only after the conclusion of the experimental year. At that time the means and the standard deviations for both written and practical grades in 1960-1961 were compared with those in 1959-1960. The resulting data are presented in Table 4. The most striking aspect of these data was the remarkable reduction in the standard deviation for practical grades in 1960-1961 in comparison with 1959-1960. This improvement in the stability of the practical grades was interpreted as evidence of the success of the revised grading system. In addition, the teaching staff felt that the revised practical grading sheet improved the stability of the grades.

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[12] Sidney Siegel, *Non-Parametric Statistics for the Behavioral Sciences* (New York: McGraw-Hill Book Co., Inc., 1956), p. 229.

Table 3

COEFFICIENTS OF CONCORDANCE AND
LEVEL OF SIGNIFICANCE FOR
TEN DENTAL PREPARATIONS

Dental Preparation	Coefficient of Concordance	Level of Significance
I	.67	.01
II	.51	.05
III	.72	.01
IV	.86	.01
V	.91	.01
VI	.74	.01
VII	.47	.10
VIII	.33	.30
IX	.72	.01
X	.49	.10

CONSTRUCTION OF ATTITUDE MEASUREMENTS

Two types of attitude measurements were employed in this study: (1) a series of scales measuring student attitudes towards the teachers and the teaching of the course, and (2) a series of "expectancy" inventories measuring student attitudes towards the use of television as a teaching device.

Attitude Scales

Were student attitudes towards the work of the course in the TV class different from those in the CV class? Did student attitudes in the TV class change as the course progressed through the three trimesters? In order to answer questions of this nature three attitude scales were developed.

Table 4

THE MEANS, STANDARD DEVIATIONS AND N'S FOR THE ACHIEVED COMPOSITE WRITTEN GRADES AND ACHIEVED COMPOSITE PRACTICAL GRADES FOR 1959-1960 AND 1960-1961

Achieved Composite Grade		1959-1960	1960-1961	1960-1961	
				CV	TV
Written	$\bar{X}$	149.41	148.94	149.26	148.61
	SD	9.99	10.27	11.20	9.31
Practical	$\bar{X}$	157.04	158.99	160.05	157.94
	SD	14.31	7.96	7.86	7.97
		N=158	N=154	N=77	N=77

One scale dealt with attitudes towards the Laboratory Lecturer (hereafter called the LL Scale; the second dealt with attitudes towards the Laboratory Demonstrators (the LD Scale), and the third with attitudes towards visual materials (the VM Scale). These three attitude scales were chosen on the basis of questionnaire and interview data from juniors and seniors who had taken Sophomore Operative Dentistry. It was easy to see why these students would believe that attitudes toward the LL and LD were important. VM attitudes were considered important because of the extensive use of models and other visuals in the course, and because of the obvious visual element of the television medium.

Two widely used methods of attitude scale construction were used—a combination of the Thurstone method of equal-appearing intervals and Likert's method of summated ratings.[13]

In applying the Thurstone and Likert techniques the principal steps were: (1) in 1959-1960 a large pool of attitude statements regarding the teaching of Sophomore Operative Dentistry was secured from students who were taking or had taken the course. (2) From this pool of statements, 291 were selected and administered to 100 seniors who rated each item on a "favorable-unfavorable" scale. (3) The resulting data were analyzed according to Thurstone's procedures and the "best" 160 items were determined. (4) The 160 items were rearranged in Likert-format and administered to 100 juniors who rated each item on an "agree-disagree" scale. (5) The resulting data were analyzed according to Likert's procedures and the "best" sixty-eight items were chosen. These sixty-eight items comprised the three attitude scales that were used during the experiment the following year. Further details regarding the above five steps will next be presented.

The pool of items.—At the close of the 1959-1960 year—the year prior to the start of controlled experimentation—several free form, anonymous questionnaires were distributed to sophomore, junior and senior students asking for descriptions of concrete instances of good and bad dental teaching—specifically of Operative Dental Technics, and also asking students to imagine good and bad instances of dental television teaching. These questionnaires were also distributed to the Operative Dental Faculty. In addition, tape recorded interviews were held with small groups of students; these were also anonymous. Beyond asking for concreteness, the questionnaires and interviews made no attempt to pick out or stress particular areas or problems.

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[13] Allen L. Edwards, *Techniques of Attitude Scale Construction* (New York: Appleton-Century-Crofts, Inc., 1957), p. 201.

The original comments and descriptions were placed on index cards and revised and rephrased, when necessary, into suitable item form according to Edwards'[14] and Thurstone's criteria.[15] These items were then compared with items from other inventories to see if there were any noticeable omissions.[16] No questionnaire, regardless of the item selection technique, can be any better than the material originally placed in the pool. This study provided no external validity measure of these items. The pool was large, however, and 291 were finally selected for inclusion in the first step or Thurstone-style administration.

Table 5

NUMBER OF POSITIVE AND NEGATIVE
THURSTONE-ITEMS ACCORDING
TO CONTENT CATEGORY

Positive	Negative	Uncertain	Total
	Laboratory Lecturer		
75	77	6	158
	Laboratory Demonstrator		
25	27	2	54
	Visual Materials		
25	27	1	53
	Miscellaneous		
10	14	2	26
	Total		
135	145	11	291

Thurstone administration.—These 291 items were prepared according to Seashore and Hevner's modification which simplified administration.[17] A nine-point scale appeared to the left of each item as follows:

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[14] *Ibid.*, p. 13.

[15] Louis L. Thurstone and E. J. Chave, *The Measurement of Attitude* (Chicago: The University of Chicago Press, 1929), p. 22.

[16] Dwight E. Beecher, *The Evaluation of Teaching* (Syracuse: Syracuse University Press, 1949).

[17] R. H. Seashore and Kate Hevner, "A Time Saving Device for Construction of Attitude Scales," *Journal of Social Psychology*, IV (August, 1933), 366-372.

Fav				N				Unf
1	2	3	4	5	6	7	8	9

This sequence of items was randomized and divided into halves in order to produce two booklets—291 items are too many for one administration. Each of these two booklets was also prepared in reversed form by reversing the continuum of point headings in order to reduce bias. Table 5 summarizes the number of positive and negative items according to their content category.

Analysis of Thursone data.—The responses were tabulated for the Q value (the interquartile range) and instead of solving for the actual S value (the median) only the scale category was secured. Table 6 presents this information in summary form for the total of 291 items.

Table 6

THURSTONE-ITEM SUMMARY:
ITEM CONTENT CLASSIFIED BY SCALE CATEGORY AND POSITIVE AND NEGATIVE FORMAT

Content Category		Scale Category									Total
		1	2	3	4	5	6	7	8	9	
LL	Positive	18	42	12	1	2					75
	Negative					4	4	13	39	17	77
	Uncertain				2	4					6
	Total	18	42	12	3	10	4	13	39	17	158
LD	Positive	5	19	1							25
	Negative							5	21	1	27
	Uncertain		1			1					2
	Total	5	20	1		1		5	21	1	54
VM	Positive	1	20	4							25
	Negative						3	11	12	1	27
	Uncertain					1					1
	Total	1	20	4		1	3	11	12	1	53
Misc.	Positive	4	5		1						10
	Negative						1	3	7	3	14
	Uncertain					2					2
	Total	4	5		1	2	1	3	7	3	26
	Totals	*28*	*87*	*17*	*4*	*14*	*8*	*32*	*79*	*22*	*291*

On the basis of the Thurstone data, the set of 291 items was now reduced to 160 items for Likert administration. All items with S=1 and 9 were selected and all items with S=2, 3, 7 and 8 were also selected provided that the Q was below 2 except for: (1) items with similar content, (2) items with particularly important content, and (3) poorly edited items.

Items with S=4, 5 and 6 were not used.

Likert administration.—The 160 items that were chosen from the Thurstone were now rearranged in Likert-format and administered. This procedure was as follows: (1) a six point scale was used with the following headings: Strongly Agree, Agree, Mildly Agree, Mildly Disagree, Disagree, Strongly Disagree, (2) each Thurstone item originally phrased in the present tense, was now prepared in the past tense, (3) in order to clarify scoring the negative items and to make control of students easier during testing, a sample test-sheet containing several rejected Thurstone items was prepared and administered by means of group discussion-scoring, (4) the 160-item Likert was administered to 100 juniors who had had Sophomore Operative Dentistry in 1959-1960, the year preceding formal experimental control. The juniors, in contradistinction to the seniors, for scheduling reasons, met in several small groups. The following data were secured for each item: (1) mean, (2) standard deviation and, for purposes of internal consistency analysis needed to produce homogeneous sets of items, (3) the product-moment *r* for each of these items with the pool of 160 items as well as the correlation of each VM and LD item with its own sub-pool. The Thurstone method provides no way of determining the value of an item for the particular scale being constructed. It offers no way of selecting items within a given interval.[18] Item-total correlations are one type of item-analysis.[19] The *r* of each LL item with its own sub-pool was not determined because of the large number of LL items.

The sub-pool of LL items was now reduced. All items with *r* over .56 were selected except borderline items having significant content and items with overlapping content. The final LL scale had thirty-two items.

The cutting point for the *r* of the LD items was .47 and the cutting point for the *r* of the VM items was .38. The same general policy of making exceptions for items was followed by these two scales as for the LL scale. The final LD and VM scales each had eighteen items.

The following figures compare the mean correlation and the standard deviation of the three sub-pools with the mean correlation and the standard deviation of the final sets of thirty-two LL, eighteen LD and eighteen VM items.

		Sub-pool	*N*	*Final Set*	*N*
LL	$\bar{X}$	.44	81	.61	32
	SD	.21		.10	
LD	$\bar{X}$	.41	40	.56	18
	SD	.14		.05	
VM	$\bar{X}$	.44	27	.50	18
	SD	.09		.08	

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[18] A. L. Edwards and F. B. Kilpatrick, "A Technique for Construction of Attitude Scales," *Journal of Applied Psychology*, XXXII (August, 1948), 374-384.

[19] Guilford, *op. cit.*, p. 458.

The final LL, LD and VM scales are in Appendixes E, F and G, respectively.

Expectancy Inventory

In order to provide an attitudinal baseline, an Expectancy Inventory asking students to indicate their expectations of the value of television teaching *in comparison* with conventional instruction, was administered to each of the two classes at their first laboratory meeting, Monday morning and Monday afternoon, respectively, Trimester I, *prior* to the start of laboratory instruction. These items were made up, Likert-style, covering representative areas. Following are two sample items:

> 3. *Amount of Studying.* In comparison with regular instruction, I feel that in a televised class of operative technic I would study:
>
>   1. Much less.
>   2. Less.
>   3. About the same amount.
>   4. More.
>   5. Much more.
>
> 19. *Demonstration Work.* In comparison with regular instruction, I feel the demonstration work in a televised course of operative technic would be taught:
>
>   1. Very well.
>   2. Well.
>   3. In about the same way.
>   4. Poorly.
>   5. Very poorly.

Neither of the classes was advised, at the time of the administration of the Expectancy Inventory, which class would receive which form of instruction. However, college scheduling did not allow the classes to be made up on the basis of the responses to the Expectancy items.

This Expectancy Inventory with the tense of each item changed appropriately was then administered at the *close* of each of the three trimesters to the TV class only. Following are the two previous sample items with changed tense:

> 3. *Amount of Studying.* In comparison with regular instruction, I feel that in a televised class of operative technic I study:
>
>   1. Much less.
>   2. Less.
>   3. About the same amount.
>   4. More.
>   5. Much more.
>
> 19. *Demonstration Work.* In comparison with regular instruction, I feel the demonstration work in a televised course of operative technic is taught:
>
>   1. Very well.

2. Well.
3. In about the same way.
4. Poorly.
5. Very poorly.

These two inventories are referred to hereafter as Pre-Expectancy (Pre-EX) and Post-Expectancy (Post-EX). The complete inventory is reproduced in Appendix H.

In summary, three attitude scales covering attitudes toward LL (thirty-two items), attitudes toward LD (eighteen items) and attitudes toward VM (eighteen items) were constructed by combining the Thurstone and Likert techniques in order to secure three homogeneous sets of items. This battery of three scales was administered to each class at the end of each trimester.

An expectancy inventory (Pre-EX) of twenty-five Likert-style items covering representative areas was constructed in order to provide an attitude baseline and it was administered to each class prior to the start of instruction. Each item in this inventory asked students for their expectations of TV teaching in *comparison* with CV teaching. At the end of each trimester this inventory with each item changed appropriately in tense was administered to the TV class (Post-EX).

Table 7 gives the administration time of the attitude measurements.

Table 7

ADMINISTRATION TIME OF ATTITUDE MEASUREMENTS
FOR CV AND TV CLASSES:
SOPHOMORE CLASS 1960-1961

CV Class	TV Class
Start of Trimester I	
Pre-EX Inventory	Pre-EX Inventory
End of Trimester I	
LL Scale	LL Scale
LD Scale	LD Scale
VM Scale	VM Scale
	Post-EX Inventory
End of Trimester II	
LL Scale	LL Scale
LD Scale	LD Scale
VM Scale	VM Scale
	Post-EX Inventory
End of Trimester III	
LL Scale	LL Scale
LD Scale	LD Scale
VM Scale	VM Scale
	Post-EX Inventory

Teacher Rating Scale

Purpose

The experiment called for the same dental technic to be taught twice. Each lesson was to be taught in the same way, by the same staff, with minimum modifications for each of the two classes (TV and CV). In all the studies that have been conducted comparing CV and TV teaching, using the instructor as his own control, one problem has been that the instructor for any number of reasons might have done a better job in the TV class than in the CV class (or vice versa). This difference in his teaching would not lead to a fair comparison between the two media.

Another problem has also arisen: Did the LL do a better job in the afternoon because he had had a run-through with the same material in the morning? Or was he bored with his afternoon presentation because it was a repetition? In order to control these difficulties the five teachers were asked to teach their lessons as similarly as possible. A limited amount of television teaching took place before the year of controlled experimentation. This factor of prior experience helped the teaching staff to judge their work. Also the televised lessons early in the academic year, 1960-1961, tended to stabilize work later in the academic year. Despite these precautions there is no way of knowing what the relationship was between the two lessons. For this reason a group of qualified judges was used to evaluate the work of the teaching staff in the two classes. A Teacher Rating Scale was constructed for use by the judges. This scale was a general purpose Teacher Rating Scale with adaptations for use in this particular study.

Construction of the Teacher Rating Scale

After a review of the literature[20] and an examination of several rating scales a graphic rating scale covering nine categories of teaching performance along a nine point bi-polar continuum was designed to evaluate the LL and LD separately. Five of the points of the continuum were labelled as follows: 1. Poor 3. Below average 5. Average 7. Above average 9. Excellent.

The nine categories were:

I

General Appearance
Physical Well Being
Posture

II

Quality of Voice and Speech
Communication Skill

III

Poise
Personal Attitude
Mental Well Being

IV

General Scholarship
Grasp of Subject Content
Accuracy

V

Student Comfort
Routine
Classroom Neatness
Absence of Distraction
Class Control
Emergencies Met

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[20] Beecher, *op. cit.*

VI

Short Range Objectives and Long Term Plans
Planning
Review Procedure
Integration of Other Lessons and Areas

VII

Preparation and Use of Audio Visual Materials

VIII

Teaching Effectiveness

IX

Opportunity for Student Participation
Skill in Questioning and Discussion
Whole Class Involved
Maintains Class Interest

The Judges

Four judges were used in Trimester II. One of these four judges was a dentist. Another set of four judges was used in Trimester III. Due to the absence of one of the judges during one observation an additional judge was used as a substitute. One of the judges from the second set was also a dentist. A list of the judges (identified by code number) and their qualifications comprises Appendix I. The qualifications of these judges made it possible to say that they were experienced both as teachers and as evaluators.[21]

Application of the Teacher Rating Scale

The judges met with the experimenter prior to using the scale and discussed each of the categories in order to clarify both the differences among categories and the content of each category. The judges were also requested to supplement their ratings with written explanatory comments. These written comments were clipped to the completed Rating Scale, making it possible to examine, in an informal way, variations in the use of criteria. A request for comments probably also serves to make the Rating Scale more dependable.[22]

The group of raters and the experimenter also discussed four of the constant errors found in rating scale work: error of leniency, error of central tendency, halo effect, and logical error. Authorities suggest that raters do better when advised of these errors.[23]

After observing a lesson, the judges usually reassembled in order to hold further discussions and to write up their comments.

Each judge agreed to be present for the entire day and each of the two lessons observed on any one day was in no case longer than an hour. This made it possible to say that the judges did not feel rushed in doing their work.[24]

The judges were *not* told their purpose was to evaluate the *similarity* of both presentations.[25] They were simply asked to use the Teacher Rating Scale in order to evaluate two lessons on a set of criteria.

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[21] Guilford, *op. cit.*, p. 294.
[22] *Ibid.* [23] *Ibid.*, p. 278. [24] *Ibid.*, p. 294. [25] *Ibid.*, p. 295.

Perfect control was not possible for these observations. On occasion judges did not rate categories. They were permitted to do this although they were requested to fill out the Rating Scale completely. On occasion particular teaching problems required deviations from the teaching schedule. The judges observed one lesson in Trimester II and three lessons in Trimester III. The judges observed both the lectures and the demonstrations when taught CV and when taught via TV. When observing the TV lecture-demonstration, the judges were permitted to take any seat they wished. However, when they observed the CV lecture, the seating positions of the judges were rotated. Figure 3, page 18, shows the seating positions of the judges. The judges also rotated their observation of the LD's.

From the point of view of the purpose of the Teacher Rating Scale—a measure of similarity—some of the comparisons were not clear-cut. For example, the comparison between one TV demonstration and eight personal demonstrations by four LD's made direct comparisons difficult. Another difficulty was with the category covering scholarship. Actually, the only competent judgment could be made by the dentist-judge although *all* judges were asked—but not required—to complete all categories.

Statistical Treatment of the Data

1. The judges were instructed to place their mark at any point along the continuum. These marks were then scored in terms of mid-points: 0.5 to 1.49=1; 1.5 to 2.49=2; et cetera.
2. These scores of the four judges were averaged for each category for each observation by lecture and by each of the two demonstrations, separately.
3. Each category mean was then combined with the mean of its comparison observation to produce a grand mean. Each judge's rating for both observations by categories was then entered in a 2 x 2 contingency table carrying the following four headings: Observation I, Observation II, "Above Grand Mean," and "Below Grand Mean."

These data were then analyzed by Fisher's exact probability test.[26] This test is a non-parametric method that examines discrete data. The assumption has been made that the Teacher Rating Scale is discrete. Fisher's test is useful when the frequencies are small. Essentially, the test determines whether the two independent groups (or observations) differ in the proportion with which they fall into two classifications.

Analysis of the Data

For the thirty-six category-comparisons on the four observations, Table 8 shows only those comparisons that were significantly different at the .05 level, for a two-tail test. Examination of this table shows that most of the thirty-six categoric comparisons were not significantly at usually acceptable levels. Three comparisons, however, were significantly different.

In Trimester III, the second observation showed one significant category—communication skills—in LD work. Here, the judges preferred the CV lesson. Examination of the judges' comments showed that one judge had no criticism to offer of the two classroom laboratory demonstrations but that the television demonstration speaker talked too fast, in a monotone,

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[26] Siegel, *op. cit.*, p. 96.

Table 8

SIGNIFICANT COMPARISONS FOR THE TEACHER RATING SCALE BY MEANS OF FISHER'S EXACT PROBABILITY TEST

	Trimester III, Observation 2 *Laboratory Demonstration Work*
Category II Quality of Voice and Speech Communication Skill	.05 level
	Trimester III, Observation 3 *Laboratory Lecture Work*
Category VII Preparation and Use of Audio-Visual Materials	.05 level
	Trimester III, Observation 3 *Laboratory Demonstration Work*
Category IX Opportunity for Student Participation Skill in Questioning and Discussion Whole Class Involved Maintains Class Interest	.02 level

and that it was impossible for the students to take notes. The other judges made no specific comments about the basis of their preference for the classroom LD's.

The third observation in Trimester III had one significant comparison for the LL: use of audio-visual materials. Three judges clearly felt that the CV LL was deficient, comparatively, because the VM could not be seen easily by all the students. One judge felt that the VM did not really contribute to the understanding of the lesson.

Also in the third observation in Trimester III all four judges felt that there was more student participation (Category IX) in the personal small group of demonstrations by the four LD's than in the TV lecture.

These three significant categories did not add up to any trend in any particular category or in a particular medium. On the basis of the data presented for four observations by these judges, there appeared to be no clear pattern of differences between TV and CV teaching.[27]

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[27] All of the raw data used in this chapter as well as in the next chapter will be retained by the experimenter for ten years. Inquiries should be addressed in care of the Department of Speech, University of Southern California, Los Angeles 90007.

Most of the calculation work described in this chapter and in Chapter IV was programmed for the new IBM 650, 1620, or 7090.

The multiple regression equations used for predictive purposes were developed by the Service Bureau Corporation (New York City), a division of IBM. The particular SBC program used was MR-2. Chi-squares were solved by a program of Abacus Associates of New York City. Covariance was run on the BIMD series of the University of California, Los Angeles. Parts of several of these covariance runs were also programmed at New York University, as were all other calculations in this study with the exception of the Thurstone-Likert tabulation, Fisher's exact probability test, and Kendall's W. Several covariance runs were checked by hand. The Thurstone-Likert tabulations were done by hand and spot-checked. Fisher's exact probability test and Kendall's W were also solved by hand and spot-checked. The predicted scores were also spot-checked by hand. Several *t*'s were checked by a second program. The chi-square trichotomy was checked against the raw data. Several chi-squares were done by hand. Whenever raw data were transferred from one set of forms to another, the columns were read back. Card punching was verified.

Chapter IV

PRESENTATION AND INTERPRETATION OF DATA

In Chapter I the problem was stated as a series of six null hypotheses. That these hypotheses would be subdivided and presented in greater detail in Chapter IV was also indicated. That plan was followed in organizing this chapter. The caption for each section of this chapter identifies the general topic to which the data refer. Two or more hypotheses are treated within each section. The internal organization of each section follows this sequence: (1) statement of hypotheses, (2) presentation of data, and (3) discussion. A null hypothesis is identified by the customary symbol H_0.

ACHIEVED WRITTEN AND PRACTICAL GRADES

Statement of Hypotheses

In order to compare the achieved grades of the CV class with those of the TV class, four null hypotheses were tested. Two of these hypotheses dealt with the means of each group as a whole (N=77 for each); one hypothesis was on written grades and the other on practical grades. Two additional hypotheses made possible more detailed comparisons of the written and practical grades of both classes divided into thirds—high, middle, and low aptitude students. The four hypotheses were stated as follows:

1. H_0 There is no significant difference between the written grades achieved in the CV class and the written grades achieved in the TV class, within each trimester.

   Statistical procedure: *t* test for uncorrelated samples (one-tailed).

2. H_0 There is no significant difference between the practical grades achieved in the CV class and the practical grades achieved in the TV class, within each trimester.

   Statistical procedure: *t* test for uncorrelated samples (two-tailed).

3. H_0 There is no significant difference between the written grades achieved by high, middle and low written-aptitude CV students and the written grades achieved by high, middle and low written-aptitude TV students, respectively, within each trimester.

   Statistical procedure: *t* test for uncorrelated samples (two-tailed).

4. H_0 There is no significant difference between the practical grades achieved by high, middle and low practical-aptitude CV students and the practical grades achieved by high, middle and low practical-aptitude TV students, respectively, within each trimester.

   Statistical procedure: *t* test for uncorrelated samples (two-tailed).

Presentation of Data

Table 2, p. 27, presents the means and t ratios for CV and TV classes on both of the predicted variables used to create each of the classes—composite written grade and composite practical grade. The t test between the predicted composite written means demonstrated that the two classes probably came from different populations ($p=<.05$). This necessitated covariance analysis of the achieved written grades.

The t's between the predicted composite practical means demonstrated that the two classes probably came from the same population. Nevertheless, covariance was used as a matter of routine.

Table 9 presents the means and t ratios for both the achieved written and achieved practical grades, unadjusted—prior to covariance analysis, for each of the CV and TV classes for each trimester. Appendix J lists the achieved written and the achieved practical grades for each student in the CV and TV classes.

Table 9

THE MEANS AND t'S FOR THE ACHIEVED WRITTEN AND ACHIEVED PRACTICAL GRADES FOR CV AND TV CLASSES: TRIMESTERS I, II, AND III [a]

Trimester	Mean CV	Mean TV	t	In Favor of
	Achieved Written Grades			
I	81.13	81.16	.036	TV
II	71.88	71.61	.26	CV
III	77.34	77.01	.33	CV
	$t_{.05}=1.66$		df=150	
	Achieved Practical Grades			
I	79.00	80.13	.78	TV
II	77.87	77.74	.18	CV
III	82.18	80.04	3.03[b]	CV
	$t_{.05}=1.98$	$t_{.01}=2.61$	df=150	

[a] In constructing the predicted composite written grades, the sum of grades for Trimesters II and III, only, was used. However, in analyzing the results, written grades for Trimester I were examined, in order to use all available data. The examination for Trimester I, 1960-1961, was objective.

[b] Significant at .01 level.

Table 10 presents the adjusted means and adjusted F's for achieved written and achieved practical grades, for each trimester. These were secured by analysis of covariance.

Table 10

THE ADJUSTED MEANS AND ADJUSTED F'S FOR
ACHIEVED WRITTEN AND ACHIEVED PRACTICAL
GRADES: TRIMESTERS I, II, AND III

Trimester	Adjusted Mean		Adj. F	In Favor of
	CV	TV		
	Written Grades			
I	80.91	81.38	.27	TV
II	71.28	72.21	.98	TV
III	76.73	77.62	1.05	TV
	Practical Grades			
I	78.80	80.33	1.65	TV
II	77.75	77.86	.03	TV
III	82.10	80.12	10.10*	CV

$F_{.05}=3.91$ $F_{.01}=6.81$ df=1,150

*Significant at the .01 level.

Discussion

The *t* test, Table 9, demonstrated that any differences between the means of achieved written grades were improbable and the analysis of covariance, Table 10, demonstrated that the similarity on achieved written work for these two classes, for each trimester, was not significantly influenced by the disparity between predicted means.

The *t* test for a difference between practical means demonstrated that differences were improbable for Trimesters I and II, and that there probably was a difference between the unadjusted scores in Trimester III on practical grades (p=<.01) in favor of CV students.

The F ratio between the adjusted practical means, secured by covariance, demonstrated a probable difference (p=<.01) between means on practical grades in Trimester III in favor of CV students, and that the differences in Trimesters I and II were not significant.

The use of covariance did not disturb the general picture given by the *t*'s for the written and practical grades, except that three of the non-significant differences shifted direction from "in favor of CV" to "in favor of TV."

The finding that there was no significant difference on written grades between the CV and TV classes was consistent with many previous similar studies, several of which were reviewed in Chapter II. In the present study, however, the TV class did as well as the CV class, despite the fact that the latter group was favored at the start in terms of matching on predicted written grades. Thus it could be said that the TV class did better than expected on written work. This achievement, however, could scarcely be attributed to a superiority of the television medium. A more likely explanation appeared to be that the operation of many factors (customary in studies of this type) tended to equate grades on written work, e.g., the Monday morning joint lectures, the use of a common text book, and the usual outside of class student activities, such as sharing notes, discussing class assignments, etc.

The findings regarding practical grades were more difficult to interpret. During Trimesters I and II the practical grades for the two groups were highly similar. Why were the practical grades during Trimester III significantly higher in the CV class than in the TV class?

One possible reason was that the format and teaching procedures were changed in Trimester III. Thus the meeting times of the CV and TV sections were reversed. But there was no reason to suppose that this change of times would disturb one group either more or less than the other group. Also, during the third trimester the lectures in the TV class were delivered alternately from the TV studio and from the platform. If this alternation confused the TV students, they did not seem to be aware of it. Their attitudes toward the Laboratory Lecturer were consistently more favorable than the CV attitudes and this difference was greatest in Trimester III, as is shown in Table 18.

Another possible explanation was that television was adequate for the teaching of the earlier and easier laboratory projects but less adequate for the teaching of the later and more difficult assignments. But this was contradicted, at least indirectly, by the fact that the attitudes of the TV students toward the televised presentation of Laboratory Demonstrators and Visual Materials were significantly more favorable than were the attitudes of the CV class toward the non-televised demonstrations and visuals—as is shown in Tables 20 and 22.

A more important objection to the above explanations was their assumption that the TV grades declined in the third trimester; Table 9 shows that this was not the case. The data show that the TV students' practical grades for the third trimester were almost the same as their own grades for the first trimester, and that their grades for the third trimester were 2.3 points higher than for the second trimester. Meanwhile, the CV students' practical grades for the third trimester were 3.18 points higher than their own grades for the first trimester, and 4.31 points higher than for the second trimester. Thus the TV grades did not go down; rather, the CV grades went up sharply. The question became whether or not the practical grades in a conventionally taught class customarily showed a significant third trimester upturn. Therefore the practical grades for the previous class of 1959-1960 were analyzed. No upturn was found. On the contrary, those grades dropped drastically from 80.5 for the second trimester to 76.6 for the third trimester. Apparently some unusual and unknown independent variable was at work in the CV class during the third trimester of 1960-1961, a variable which was not operative in the TV class.

These data give rise to a further question. What part does aptitude play in the results? For this reason, the interaction between predicted composite grades, or aptitude, and achieved grades were examined. This will be discussed next for written and for practical grades separately.

WRITTEN GRADES

Presentation of Data

Each class was trichotomized, producing a top, middle and low written ability third and a top, middle and low practical ability third. The N's for each third were 26, 25 and 26, respectively. The validity of this new comparison rested on the assumption of a prior similarity between CV and TV trichotomies on both predicted composite written and predicted composite practical work.

Table 11 shows the means and the *t* ratios for the predicted composite written grades for the CV and TV classes, for each trichotomy. These *t*'s for the predicted composite written grades made it possible to reject the null hypothesis and to state that there was a probable difference between predicted means for CV and TV classes on the top ($p=<.01$) and middle ($p=<.01$) thirds. However, the *t* for the low written trichotomy was not significant. The *t*'s between the means for the predicted composite written variable made analysis of covariance necessary for the top and middle thirds and advisable for the low third. Table 12 shows for each trimester the means, N's and the *t*'s for the achieved written grades for each predicted composite written trichotomy. Table 13 presents the adjusted means and the adjusted F's on achieved written grades for the CV and TV predicted aptitude trichotomies for each trimester.

Table 11

THE MEANS, N'S AND *t*'S FOR TOP, MIDDLE AND LOW WRITTEN-APTITUDE TRICHOTOMIES FOR CV AND TV CLASSES

Trichotomy	N	Predicted Composite Written Mean CV	TV	*t*	In Favor of
Top	26	156.58	153.17	2.73*	CV
Mid	25	149.32	146.94	5.51*	CV
Low	26	142.97	141.46	1.86	CV
	$t_{.05}=2.008$	$t_{.01}=2.678$		df=50	
	$t_{.05}=2.01$			df=48	

*Significant at the .01 level.

Discussion

The predicted written grades, or aptitudes, of the CV group as a whole were significantly higher than those of the TV group, as was reported in Chapter III. The further analysis of these data, shown in Table 11, above, indicated that most of the advantage of the CV group fell in the high and middle trichotomies. Roughly speaking, the brightest students in the TV class were not as bright as the brightest ones in the CV class. This analysis appeared to give additional weight to the previously reported conclusion that the TV class did better than could have been expected on written work.

None of the nine *t*'s in Table 12 and none of the F's in Table 13 are statistically significant. Therefore, the conservative conclusion would be that all differences in written grades among aptitude levels were null, and the aptitude data cast no new light upon achieved written grades. However, two features of the data in Tables 12 and 13 appeared to merit comment: (1) the non-significant t's in Table 12 were divided five to four in favor of CV; after adjustment by covariance analysis, the direction of the F's became seven to two in favor of TV. The latter comparison gave additional reinforcement to the conclusion that the TV class did better than could have been expected on written work. (2) Of the nine F's in Table 13, the only one that approached significance was in the low aptitude group. Perhaps TV instruction was slightly more advantageous for low aptitude students than for students with higher aptitudes.

Table 12

THE MEANS, N'S AND t'S ON ACHIEVED WRITTEN GRADES
FOR EACH WRITTEN-APTITUDE TRICHOTOMY:
TRIMESTERS I, II, AND III

Trimester	Mean		t	In Favor of
	CV	TV		
	Top Trichotomy			
	N=26			
I	81.81	82.31	.38	TV
II	75.81	74.62	.79	CV
III	81.42	79.54	1.26	CV
$t_{.05}=1.68$				df=50
	Middle Trichotomy			
	N=25			
I	81.40	81.36	.03	CV
II	70.72	71.08	.2	TV
III	77.72	76.32	.86	CV
$t_{.05}=1.68$				df=48
	Low Trichotomy			
	N=26			
I	80.19	79.81	.25	CV
II	69.08	69.12	.02	TV
III	72.89	75.15	1.45	TV
$t_{.05}=2.01$		$t_{.01}=2.68$		df=50

PRACTICAL GRADES

Presentation of Data

The t's for the predicted composite practical means, Table 2, page 27 indicated closer matching on this variable than on written work. However, a significant difference between

Table 13

THE ADJUSTED MEANS AND ADJUSTED F'S FOR ACHIEVED WRITTEN GRADES FOR EACH WRITTEN APTITUDE TRICHOTOMY: TRIMESTERS I, II, AND III

Trimester	Adjusted Mean CV	Adjusted Mean TV	F	In Favor of
	Top Trichotomy N=26			
I	81.43	82.69	.81	TV
II	74.96	75.47	.12	TV
III	80.60	80.36	.03	CV
	Middle Trichotomy N=25			
I	80.76	82.50	.21	TV
II	70.31	71.49	.16	TV
III	77.31	76.73	.15	CV
	Low Trichotomy N=26			
I	79.99	80.01	.0001	TV
II	68.63	69.57	.30	TV
III	72.53	75.51	3.56	TV

$F_{.05}=4.03$ $F_{.01}=7.17$ df=1.50

Table 14

THE MEANS, N'S AND t'S FOR TOP, MIDDLE AND LOW PRACTICAL-APTITUDE TRICHOTOMIES FOR CV AND TV CLASSES

Trichotomy	N	Predicted Composite Practical Mean CV	Predicted Composite Practical Mean TV	t	In Favor of
Top	26	165.05	165.40	.24	TV
Middle	25	155.90	154.85	2.01*	CV
Low	26	147.85	146.51	1.30	CV

$t_{.05}=2.01$ df=48

*Significant at the .05 level.

classes was found in the middle trichotomy ($p=<.05$) in favor of the CV class, which necessitated covariance analysis for that group (Table 14). Covariance was also used for the other trichotomies as a matter of routine. Table 15 shows for each trimester the means and *t*'s for the achieved practical grades for each predicted composite practical trichotomy.

Table 15

The Means, N's and *t*'s on Achieved Practical
Grades for Each Practical Aptitude Trichotomy:
Trimesters I, II, and III

Trimester	Mean		*t*	In Favor of
	CV	TV		
	Top Trichotomy			
	N=26			
I	84.58	85.29	.47	TV
II	80.42	81.92	1.39	TV
III	84.50	83.27	1.12	CV
$t_{.05}=2.01$			df=50	
	Middle Trichotomy			
	N=25			
I	79.88	81.66	.91	TV
II	78.68	76.56	1.97 [a]	CV
III	81.88	78.52	3.37 [b]	CV
$t_{.05}=1.68$		$t_{.01}=2.40$	df=48	
	Low Trichotomy			
	N=26			
I	72.58	73.50	.34	TV
II	74.54	74.69	.16	TV
III	80.15	78.27	1.62	CV
$t_{.05}=2.01$			df=50	

[a] Significant at the .05 level.
[b] Significant at the .01 level.

Table 16 presents the adjusted means and the adjusted F's after covariance analysis for the practical grades for each trichotomy in each trimester.

Discussion

The data presented in Tables 12, 15 and 16 suggested a possible additional interpretation of why the CV class significantly outscored the TV class on practical grades during the third trimester. This difference could have been partially due to a vagary of the matching process. The logic supporting the preceding statement proceeded as follows: (1) although the whole groups (N=77; N=77) were matched within the boundaries of chance on the variable of predicted practical aptitude, nevertheless (2) the middle third (N=25) of the CV class was significantly higher on predicted practical aptitude than the middle third of the TV class. (3) Most of the advantage in achieved practical grades in favor of the CV class was contributed by the middle third (Table 15). During the first trimester there was no significant difference between the middle thirds of the CV and TV groups. During the second trimester, however, the middle third of the CV section moved ahead significantly. During the third trimester the CV middle third achieved a very significant lead ($p = < .01$). (4) Therefore, the unusually high CV practical grades of the third trimester could have been partially due to the fact that a relatively small number of students in the CV class had significantly higher practical aptitude than their counterparts in the TV class.

Table 16

THE ADJUSTED MEANS AND ADJUSTED F'S FOR
ACHIEVED PRACTICAL GRADES FOR EACH
PREDICTED PRACTICAL-APTITUDE TRICHOTOMY:
TRIMESTERS I, II, AND III

Trimester	Adjusted Mean		Adj. F	In Favor of
	CV	TV		
	Top Trichotomy			
	N=26			
I	84.66	85.21	.18	TV
II	80.48	81.86	2.06	TV
III	83.21	84.55	1.7	TV
	Middle Trichotomy			
	N=25			
I	79.70	81.84	1.09	TV
II	78.59	76.65	2.96	CV
III	81.65	78.75	8.10[a]	CV
	Low Trichotomy			
	N=26			
I	71.97	74.11	.68	TV
II	74.48	74.75	.09	TV
III	80.14	78.28	2.58	CV
$F_{.05}=4.03$		$F_{.01}=7.17$	df=1.50	

[a] Significant at the .01 level.

But why did not the TV students overcome this initial disadvantage on practical work, the same as they overcame an even greater disadvantage on written work? An answer has previously been suggested (page 44). Several major factors probably worked toward equating the written grades, e.g., the Monday morning joint lecture meeting, a common textbook, sharing notes out of class, et cetera. There appeared to be fewer similar factors working to equalize practical grades.

ATTITUDES TOWARD THE TEACHERS AND THE TEACHING OF THE COURSE

As previously reported in Chapter III, three scales were constructed for the purpose of measuring student attitudes toward the teachers and the teaching of the course. These three scales were identified as LL (Laboratory Lecturer), LD (Laboratory Demonstrator), and VM (Visual Materials). The internal consistency reliability was computed for each attitude measurement. The formula used was the Kuder-Richardson 20. This provides a measure of internal consistency reliability or homogeneity. The essential advantage of the Kuder-Richardson 20 formula is that it avoids the difficulties of arbitrary split-half methods. It assumes items of nearly equal difficulty and intercorrelation. Reliability was defined as the proportion of variance that is true variance.[1] Table 17 lists these reliabilities identified by class and by

Table 17

THE KUDER-RICHARDSON 20 RELIABILITY FOR EACH
ATTITUDE MEASUREMENT IN THE CV AND TV CLASSES:
TRIMESTERS I, II, AND III

CV Class		TV Class	
Attitude Measurement	Reliability	Attitude Measurement	Reliability
LL I	.93	LL I	.91
LL II	.94	LL II	.95
LL III	.96	LL III	.96
LD I	.88	LD I	.88
LD II	.89	LD II	.88
LD III	.97	LD III	.90
VM I	.89	VM I	.86
VM II	.88	VM II	.88
VM III	.89	VM III	.91
Pre-EX	.91	Pre-EX	.93
		Post-EX I	.91
		Post-EX II	.93
		Post-EX III	.92

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[1] J. P. Guilford, *Fundamental Statistics in Psychology and Education* (3d ed.; New York: McGraw-Hill Book Co., Inc., 1954), p. 436.

attitude measurements. Examination of these figures showed that the reliabilities were satisfactory. Not surprisingly, the LL scale, which has thirty-two items, had a somewhat higher reliability than the other scales which had fewer items.

As previously reported in Chapter III, an inventory was also constructed to measure the students' expectancy with regard to television as a teaching instrument. This was administered to both sections at the first class meeting (the pre-EX inventory), and to the TV section only at the end of each trimester (post-EX inventory). The expectancy inventory findings are presented and discussed in the section "Attitudes Toward TV as a Teaching Medium" in this chapter. For convenience, however, the reliability estimates for the expectancy inventory are presented here in Table 17. What is worthy of note is the following: the reliability of the scales that were constructed by means of the Thurstone-Likert procedure was about the same as the EX inventories that were "drawn free hand." Appendix K lists the attitude scores (sums across items) for each student in the CV class for each attitude administration. Appendix L lists the same data for the students in the TV class.

Table 18

THE LL SCALE:
THE MEANS AND *t*'S FOR THE CV AND TV CLASSES:
TRIMESTERS I, II, AND III

Trimester	Mean		*t*
	CV	TV	
I	142.09	148.65	1.68
II	134.25	142.45	1.88
III	133.90	143.66	2.32[a]
	$t_{.05}=1.976$	$t_{.01}=2.609$	df=152

[a] Significant at the .05 level.

Statement of Hypotheses

In order to examine student attitudes in each of the trimesters, to estimate changes in attitudes over a period of time, and to compare the classes on attitudes, three sets of null hypotheses were tested. These three hypotheses were further subdivided in terms of the LL (Laboratory Lecturer), LD (Laboratory Demonstrator) and VM (Visual Materials) scales. The three basic hypotheses were stated as follows:

H_0 There is no significant difference in attitudes, as determined by each of the attitude scales—LL, LD, and VM—taken singly:

a. within each trimester, between the CV and TV classes.

b. within each class, between any two trimesters.

c. between any trimester for one class and any trimester for the other class.

This statement of the null hypothesis provides for all possible comparisons within any one attitude scale-type.

Statistical procedure: t test for correlated and uncorrelated samples (two-tailed).

To facilitate examination of the data, the material is organized under the following headings: LL, LD and VM. Within each of these three headings, the data are presented first and then discussed.

THE LL SCALE

Presentation of Data

Table 18 compares the means and *t*'s for the CV and TV classes within each trimester for the LL scale.

Table 19 presents the *t*'s, only, for the comparisons between means for the LL within the CV class across-time and also the *t*'s for the across-time comparisons for the LL within the TV class. This table also gives the *t*'s for the across-time and across-class comparisons.

Discussion

In accordance with the experimental design, the teaching format for the faculty member responsible for the course herein identified as LL was as follows: (1) each Monday morning he gave a lecture on concepts to both groups, CV and TV, meeting jointly in an auditorium, (2) throughout the year he gave the Laboratory Lectures to the CV group from the platform in the laboratory room, (3) during Trimester I he gave his duplicate Laboratory Lectures to The TV group from the TV studio and these were televised to the laboratory room, (4) during Trimester II he gave the duplicate lectures to the TV group from the platform in the laboratory room (same as for the CV group), (5) during Trimester III he gave his duplicate lectures to the TV group alternately from the TV studio and from the platform. Thus the Monday morning lectures were each given only once; they were heard by all students in joint session. The weekly Laboratory Lectures were given in duplicate—once for the CV class and once for the TV class. Of course, these duplicate lectures were not precisely alike—the LL could only try to keep them as similar as possible. In all cases the subject of the lectures changed from week to week. Roughly speaking, the subject matter became more difficult as the year progressed.

The foregoing design was constantly kept in mind while interpreting the data derived from the LL attitude scale. It was anticipated that interpretation might be handicapped because of the rather complicated changes in the LL's role. Nevertheless, these changes were necessitated by the nature of the course, plus the understandable reluctance of the faculty members to expose the experimental group to the possibility of inferior instruction which might result from the new and relatively untried medium of television.

Tables 17 and 18 reveal two main features of the LL data: (1) in general, the ratings by the TV class tended to be more favorable toward the LL than did the ratings by the CV class, and (2) the ratings by both the TV and CV classes were less favorable toward the LL by the end of the second trimester than they were at the end of the first trimester.

The more favorable LL ratings by the TV students were considered to be a tendency or trend, rather than a decisive difference. This interpretation was based upon the significance levels: in Trimester I the difference was significant only at about the .10 level; in Trimester II, about the .07 level; but in Trimester III, almost the .02 level. A defensible explanation appeared to be as follows: (1) the CV ratings were based upon observations of platform lectures only (plus probably hearsay regarding LL's television abilities), and (2) the TV ratings were based upon direct observations of the LL's abilities through two media, and perhaps their respect for his versatility increased as the year progressed.

The second main feature of the LL data was harder to evaluate. Why did the ratings drop between Trimester I and II in both the CV and TV classes? One possible explanation was that the LL suffered a general let-down in his performance during this period of time. Another tenable explanation was that the students' ratings reflected an initial enthusiasm because of the novelty of television and other experimental procedures, an enthusiasm which declined when these procedures became routine. Other plausible explanations were possible.

Table 19

THE LL SCALE:
THE *t*'S FOR ACROSS-TIME COMPARISONS WITHIN
EACH OF THE CV AND TV CLASSES AND FOR
ACROSS-TIME AND ACROSS-CLASS COMPARISONS:
TRIMESTERS I, II, AND III

Comparison	*t*
Within CV	
LL I x LL II	3.32[a]
LL I x LL III	4.04[a]
LL II x LL III	.03
Within TV	
LL I x LL II	3.46[a]
LL I x LL III	1.81
LL II x LL III	.50
Across-Time and Across-Class	
LL I CV x LL II TV	.09
LL I CV x LL III TV	.39
LL II CV x LL I TV	3.50[a]
LL II CV x LL III TV	2.24[b]
LL III CV x LL I TV	3.78[a]
LL III CV x LL II TV	1.96

$t_{.05}=1.992$ $t_{.01}=2.643$ df=76

$t_{.05}=1.976$ $t_{.01}=2.609$ df=152

[a] Significant at the .01 level.
[b] Significant at the .05 level.

THE LD SCALE

Presentation of Data

Table 20 presents the means and *t*'s for the CV and TV classes when comparisons are made within each trimester for the LD scale.

Table 20

THE LD SCALE:
THE MEANS AND *t*'S FOR THE CV AND TV CLASSES:
TRIMESTERS I, II, AND III

Trimester	Mean		*t*
	CV	TV	
I	65.58	82.38	8.04*
II	56.99	80.99	11.12*
III	59.82	84.05	13.97*
	$t_{.05}$=1.976	$t_{.01}$=2.609	df=152

*Significant at the .01 level.

Table 21 presents the *t*'s for the comparisons between the means for the LD within the CV class across-time and also the *t*'s for the across-time comparisons for the LD within the TV class. Table 21 also gives the *t*'s for the across-time and across-class comparisons.

Discussion

In evaluating the LD data two important aspects of the experimental design were kept in mind. First, in the CV class all demonstration work was done in the laboratory, while in the TV class all demonstrations were done in the TV studio and thence televised into the laboratory. Second, in using the LD scale students were giving a composite judgment of the work of four faculty members.

Highlights of the data in Tables 20 and 21 were as follows: (1) the TV class rated the LD work more favorably than did the CV class—this was true whether comparisons were made within or between trimesters; (2) the LD ratings by the TV class did not show a drop from Trimester I to II parelleling the drop in the CV ratings for the same time interval, and (3) in both classes, CV and TV, the LD work was rated higher in Trimester III than in Trimester II.

The Laboratory Demonstrators received very significantly higher ratings from the TV class than from the CV class. Nine TV versus CV comparisons were made—three within and six between trimesters—and all nine of the differences were in the same direction and were significant beyond the .001 level. Tables 20 and 21 show that the nine *t* ratios ranged from 7.43 to 13.97. These unambiguous findings contrasted sharply with the previously reported findings relative to the LL attitude data. These LL data indicated a tendency of the TV class to rate the lectures more favorably than the lectures were rated by the CV class. However, the LL significance levels were not strong enough to justify describing the differences as more than a "tendency" or "trend."

Table 21

THE LD SCALE:
THE *t*'S FOR ACROSS-TIME COMPARISONS WITHIN
EACH OF THE CV AND TV CLASSES AND FOR
ACROSS-TIME AND ACROSS-CLASS COMPARISONS:
TRIMESTERS I, II, AND III

Comparison	*t*
Within CV	
LD I x LD II	4.59[a]
LD I x LD III	4.02[a]
LD II x LD III	2.47[b]
Within TV	
LD I x LD II	1.21
LD I x LD III	1.41
LD II x LD III	3.53[a]
Across-Time and Across-Class	
LD I CV x LD II TV	7.43[a]
LD I CV x LD III TV	9.31[a]
LD II CV x LD I TV	11.68[a]
LD II CV x LD III TV	13.04[a]
LD III CV x LD I TV	12.19[a]
LD III CV x LD II TV	11.54[a]

$t_{.05}=1.992$ $t_{.01}=2.643$ df=76

$t_{.05}=1.976$ $t_{.01}=2.609$ df=152

[a] Significant at the .01 level.
[b] Significant at the .05 level.

When differences for the LD scale across-time and within the CV class were examined, a significant drop ($p=<.01$) in rating was observed from Trimester I to II and from I to III. These two drops paralleled the findings for the LL in the CV class although the LL was not involved in the LD work for the CV class. This drop was interesting because LD work introduced a new set of people. This drop indicated that a common factor may have been operating for both scales in the CV class. There was no way of deciding whether the parallel drop resulted from a halo emanating from either the LD or the LL or whether it may have been due to a change in the subject matter or the teaching or an "initial effect," or other factor(s).

When changes across-time were examined in the TV class, it was seen that whereas the TV LL declined significantly (p=<.01) from Trimester I to II, along with the change in his teaching medium, the LD scores in the TV class did not show a significant drop from Trimester I to II or from Trimester I to III. The TV LD in Trimester III was, in fact, rated higher, but not significantly, than the TV LD in Trimester I. This stability of LD data was marked.

When the TV LD was examined from Trimester II to III, a significant increase (p=<.01) was noted. This increase paralleled the LD's ratings over the same time interval in the CV class. This argued for a common factor across classes. The CV and TV LL did not change from Trimester II to III. This argued for a discrimination of the LL from the LD. As noted, the LL ratings in the TV class did not change from Trimester II to III, but it is impossible to tie this in with the other LD data because the experimental variable (TV instruction) was not constant within itself. The ratings for the LD work were clear-cut and they indicated a change from Trimester II to III that was independent of the teaching medium itself.

THE VM SCALE

Presentation of Data

Table 22 presents the means and *t*'s for the CV and TV classes when comparisons are made for the VM scale within each trimester.

Table 22

THE VM SCALE:
THE MEANS AND ACROSS-CLASS *t*'S FOR THE CV AND TV CLASSES:
TRIMESTERS I, II, AND III

Trimester	Mean		*t*
	CV	TV	
I	73.65	81.55	3.98*
II	71.73	81.49	5.05*
III	73.00	83.90	6.03*
	$t_{.05}$=1.976	$t_{.01}$=2.609	df=152

*Significant at the .01 level.

Table 23 presents the *t*'s for the comparisons between means for the VM scale within the CV and TV classes across-time, and also the *t*'s for the across-time and across-class comparisons.

Discussion

The VM scale called for judgments of inanimate objects as well as of faculty members, all five of whom used visual materials. Such materials were a necessary and integral part of the Laboratory Demonstrators' work; by contrast, visual materials were less important to the Laboratory Lecturer. Visual materials were the same for the CV and TV sections, the time and manner of using them were the same for both groups, and the frequency of usage was the same for both groups (a few minor exceptions were described in Chapter III, page 22). However, the visual materials may have seemed more predominant in the TV class—even the bodily actions of the faculty members, when televised, may have seemed similar to the inanimate visual aids.

Table 23

THE VM SCALE:
THE *t*'S FOR ACROSS-TIME COMPARISONS WITHIN
EACH OF THE CV AND TV CLASSES AND FOR
ACROSS-TIME AND ACROSS-CLASS COMPARISONS:
TRIMESTERS I, II, AND III

Comparison		*t*
Within CV		
VM I x VM II		1.39
VM I x VM III		.49
VM II x VM III		1.04
Within TV		
VM I x VM II		.06
VM I x VM III		2.01*
VM II x VM III		2.38*
Across-Time and Across-Class		
VM I CV x VM II TV		3.96*
VM I CV x VM III TV		5.18*
VM II CV x VM I TV		5.06*
VM II CV x VM III TV		6.30*
VM III CV x VM I TV		4.70*
VM III CV x VM II TV		4.69*
$t_{.05}$=1.992	$t_{.01}$=2.643	df=76
$t_{.05}$=1.976	$t_{.01}$=2.609	df=152

*Significant at the .01 level.

Tables 22 and 23 show the following main characteristics of the VM attitude data: (1) the TV class rated the VM more favorably than did the CV class—this was true whether comparisons were made within or between trimesters, (2) the CV class ratings on VM were practically the same for Trimesters I, II, and III, and (3) the TV class ratings on VM were almost exactly the same for Trimesters I and II, but ratings were higher for Trimester III.

The VM data paralleled the LD data with regard to the very significantly favorable attitudes of the TV class as compared with the CV. The only difference was that the VM confidence levels were not as high as the LD levels. On the nine parallel comparisons the VM t ratios ranged from 3.96 to 6.30—all of which were substantially beyond the .01 level.

The CV class VM ratings did not drop across-time. This contrasted with the fact that the CV group ratings for both the LL and the LD were significantly less favorable in Trimesters II and III than they were in Trimester I. This appeared to suggest an independence for the VM in comparison with the LL and the LD.

The TV group showed one across-time significant change—they rated VM for the third trimester higher than for the previous trimesters. This increase paralleled that of the TV group ratings of the LD; these increases may have been connected because of the inherent relationship between visual materials and laboratory demonstrations. Perhaps the students thought the LD's handled their visual materials on television more effectively during Trimester III than previously.

Some of the correlation data, reported below in the section "Correlations Between Attitude Measurements," pertained directly to the discussion of TV class ratings in the preceding paragraph.

The partial correlation for VM and LD in Trimester III, holding the LL constant, was .74 (Table 32), which was the highest partial correlation for all trimesters between the VM and LD. This indicated that the joint increase came from the same students. There was also little drop from the zero order correlation in Trimester III between the LD and VM to this same partial, indicating that the LL was not influencing student judgment.

INTERACTION BETWEEN PREDICTED GRADES AND ATTITUDES

Statement of Hypotheses

The first series of hypotheses dealt with the grades achieved by students. The next series of hypotheses dealt with their attitudes. In order to examine whether or not attitudes depended upon aptitude, four null hypotheses were tested. One dealt with CV and one with TV. Each of these was further divided for written and practical work. These hypotheses follow:

1. H_0 There is no significant interaction between predicted written grades and each attitude measurement—LL, LD, VM and Pre-EX—in the CV class.

   Statistical procedure: Chi-square.

2. H_0 There is no significant interaction between predicted practical grades and each attitude measurement—LL, LD, VM and Pre-EX—in the CV class.

   Statistical procedure: Chi-square.

3. H_0 There is no significant interaction between predicted written grades and each attitude measurement—LL, LD, VM, Pre- and Post-EX—in the TV class.

   Statistical procedure: Chi-square.

4. H_0 There is no significant interaction between predicted practical grades and each attitude measurement—LL, LD, VM, Pre- and Post-EX—in the TV class.

   Statistical procedure: Chi-square.

Presentation of Data

Chi-square casts data in the form of frequencies and measures the discrepancy between an obtained frequency and an expected frequency. Here the null hypothesis tests for the existence of independence between two variables. The continuous data in each variable for this study have been trichotomized.

Table 24 presents chi-square values for each test of independence between predicted written grade levels, when trichotomized, and each attitude measurement also in trichotomy in each trimester for the CV class. Table 24 also presents the chi-square value for each test of independence between predicted practical grades, when trichotomized, and each attitude measurement also in trichotomy within each trimester—for the CV class.

Table 24

THE CV CLASS:
THE CHI-SQUARE VALUE FOR BOTH PREDICTED
COMPOSITE WRITTEN AND PRACTICAL GRADES
AND EACH ATTITUDE MEASUREMENT:
TRIMESTERS I, II, AND III

Attitude	Chi-Square	
	Written	Practical
Pre-EX	1.53	1.67
	Trimester I	
LL	.72	3.58
LD	3.96	1.93
VM	3.02	.57
	Trimester II	
LL	.77	3.75
LD	6.30	1.14
VM	1.61	1.15
	Trimester III	
LL	2.05	2.59
LD	1.88	7.14
VM	1.05	4.52

Chi-square$_{.05}$=9.48 df=4

Table 25 presents the chi-square value for each test of independence between predicted written grade level, when trichotomized, and each attitude measurement also in trichotomy for each trimester for the TV class.

Table 25 presents the chi-square value for each test of independence between predicted practical grade levels, when trichotomized, and each attitude measurement also in trichotomy for each trimester for the TV class.

Table 25

THE TV CLASS:
THE CHI-SQUARE VALUE FOR BOTH PREDICTED
COMPOSITE WRITTEN AND PRACTICAL GRADES
AND EACH ATTITUDE MEASUREMENT:
TRIMESTERS I, II, AND III

Attitude	Chi-Square	
	Written	Practical
Pre-EX	.38	1.35
	Trimester I	
LL	.67	1.39
LD	.91	8.55
VM	1.14	4.78
Post-EX	1.49	8.45
	Trimester II	
LL	7.20	2.09
LD	4.87	4.95
VM	7.01	10.55*
Post-EX	1.62	2.24
	Trimester III	
LL	4.19	2.07
LD	1.14	2.09
VM	8.21	1.83
Post-EX	4.87	2.06

Chi-square$_{.05}$=9.48 df=4

*Signficant at the .05 level.

Discussion

The data in Tables 24 and 25 provided a decisive answer to the question of whether predicted grades interact with attitudes—the answer was no. This answer was true of both the CV and TV classes during all trimesters; it was true of both written and practical aptitudes in relation to all four attitude measurements. Of the forty-six comparisons made, only one showed a significant difference.

The experimental hypotheses were based on the possibility that a student with high aptitude for written work might tend to rate lectures highly, whereas a student with high aptitude for practical work might tend to rate the demonstrators or the visual materials highly; and vice versa. If this possibility had turned out to be true, then the interpretation of attitude differences in the present study would have become much more complicated. Fortunately, the experimental hypotheses could be rejected with confidence; the null hypotheses were sustained. Predicted grades or aptitudes did not predetermine attitudes.

INTERACTION BETWEEN ACHIEVED GRADES AND ATTITUDES

Statement of Hypotheses

In order to examine the relation between achieved grades and attitude measurements four null hypotheses were tested. Two related to the written and practical work in the CV class and two related to the written and practical work in the TV class.

1. H_0 There is no significant interaction between achieved written grades and each attitude measurement—LL, LD, VM and Pre-EX—in the CV class.

   Statistical procedure: Chi-square.

2. H_0 There is no significant interaction between achieved practical grades and each attitude measurement—LL, LD, VM and Pre-EX—in the CV class.

   Statistical procedure: Chi-square.

3. H_0 There is no significant interaction between achieved practical grades and each attitude measurement—LL, LD, VM and Post-EX—in the TV class.

   Statistical procedure: Chi-square.

Presentation of Data

Table 26 presents the chi-square value for each test of independence between written grades and each attitude measurement in each trimester for the CV class. Table 26 also presents similar data for practical grades in the CV class.

Table 27 presents the chi-square value for each test of independence between written grades and each attitude measurement for each trimester in the TV class. Table 27 also presents similar data for practical grades in the TV class.

Tables 26 and 27 show that there was very little interaction between achieved grades and attitudes, and that little was erratic. Of the thirty-six comparisons made, only four were significant.

This finding was somewhat unexpected. Theoretically it seemed logical to expect that more favorable attitudes toward a course should usually be coincident with higher grades, and vice versa. Therefore the question became: why were achieved grades independent from attitudes in this study?

One possible explanation is that practically all of these students were highly motivated to learn because they had been screened through a highly selective admission policy before being permitted to enter the College of Dentistry. This uniformly high level of motivation could have resulted in maximum efforts to achieve high grades in *every* course regardless of whether they liked some professors better than others and regardless of whether they liked some courses better than others.

Another possible explanation was suggested by the trend in all of the attitude data toward the favorable ends of the scales. Thus when a class was divided into thirds, labeled "high," "middle," and "low," the labels might be deceptive—perhaps a more accurate description would be that all three categories were different degrees of "high." The data on the LL attitudes in Table 17 strongly supported this analysis. The LL scale had thirty-two items, each scored on a six-step continuum. Therefore, the theoretical scores on the LL scale are as follows:

Perfect	192
Average	112
Worst	32

Table 26

THE CV CLASS:
THE CHI-SQUARE VALUE FOR ACHIEVED WRITTEN AND
ACHIEVED PRACTICAL GRADES AND EACH ATTITUDE MEASUREMENT:
TRIMESTERS I, II, AND III

Attitude	Chi-Square	
	Written	Practical
	Trimester I	
LL	4.85	1.02
LD	1.05	1.03
VM	3.02	.31
Post-EX	.01	.15
	Trimester II	
LL	4.35	4.69
LD	2.53	8.38
VM	1.04	1.00
Post-EX	4.42	2.34
	Trimester III	
LL	2.61	.31
LD	.50	.72
VM	2.91	3.48
Post-EX	2.53	1.74

Chi-square$_{.05}$=9.48 df=4

Table 18, page 52, shows that the lowest mean score for LL was 133.9, which is far above the "average." From this viewpoint the sub-group labels (below left) might be more meaningful if changed to the new suggested labels (below right):

High	Even higher
Middle	Higher
Low	High

The attitude data for the LD and VM reflected the same trend toward the favorable end, although not as marked, as did the LL data. Almost all of the means on all four of the attitude scales, regardless of group or sub-group, were above the theoretical "average." None was significantly below that average.

Table 27

THE TV CLASS:
THE CHI-SQUARE VALUE FOR ACHIEVED WRITTEN AND ACHIEVED PRACTICAL GRADES AND EACH ATTITUDE MEASUREMENT:
TRIMESTERS I, II, AND III

Attitude	Chi-Square	
	Written	Practical
	Trimester I	
LL	5.09	.67
LD	12.81*	3.88
VM	11.14**	3.50
Post-EX	7.02	1.40
	Trimester II	
LL	1.59	.43
LD	.45	1.39
VM	4.58	10.76**
Post-EX	.92	4.21
	Trimester III	
LL	.21	11.29**
LD	.89	5.54
VM	3.06	2.54
Post-EX	5.35	1.36
	Chi-square$_{.05}$=9.48	Chi-square$_{.02}$=11.67
	Chi-square$_{.01}$=13.28	df=4

*Significant at the .02 level.

**Significant at the .05 level.

The above analysis could logically account for the lack of interaction between achieved grades and attitudes because as the range of differences is narrowed, the possibility of significant differences is diminished.

ATTITUDES TOWARD TELEVISION AS A TEACHING MEDIUM

Statements of Hypotheses

In order to compare the *expectations* of the value of television teaching prior to the start of instruction for each of the two classes, a null hypothesis was tested; and in order to examine what happened to these expectations as the academic year progressed in the TV class, another null hypothesis was tested. An additional hypothesis made comparison possible between the CV expectations and the post-EX reactions in the TV class. Also, a further hypothesis made comparison possible among the post-EX attitudes in the TV class. These four hypotheses were stated as follows:

1. H_0 There is no significant difference between the pre-EX inventories for the CV and TV classes.

   Statistical procedure: *t* test for uncorrelated samples (two-tailed).

2. H_0 Within the TV class, there is no significant difference between attitudes, as determined by the pre-EX inventory and attitudes as determined by the post-EX inventories for Trimesters I, II or III.

   Statistical procedure: *t* test for correlated samples (two-tailed).

3. H_0 There is no significant difference between attitude in the CV class as determined by the pre-EX inventory and any of the post-EX inventories in the TV class.

   Statistical procedure: *t* test for uncorrelated samples (two-tailed).

4. H_0 Within the TV class there are no significant differences among the post-EX inventories among trimesters.

   Statistical procedure: *t* test for correlated samples (two-tailed).

Presentation of Data

Table 28 presents the means and the *t*'s for the pre-EX inventory in the CV and in the TV classes. Also found in this table are the same data for the post-EX inventory administered to the TV class at the close of each trimester. Also found in this table are the *t*'s for the comparisons between the pre-EX inventory in the CV class and the post-EX inventory in the TV class; also, the *t*'s secured by comparing means between the pre-EX inventory in the TV class and post-EX inventory in the TV class.

In this series of inventories, as opposed to the scales discussed previously, scoring was *reversed*; therefore, here, *lower* score means a more favorable attitude.

Discussion

The TV and CV classes did not have equal attitudes prior to the start of the study. The CV class-to-be had a significantly higher expectation (p=<.01) of the value of TV than did the TV class-to-be. Neither class knew at the time of administration of this scale which class would receive which form of instruction. At first, this inequality appeared to be unfortunate. However, when the remaining data for this inventory were examined this difference did not turn out to be a handicap.

The *t*'s comparing the pre-EX inventory in the TV class with the post-EX inventory in the TV class showed that the TV class found itself more satisfied with TV instruction than it had anticipated (p=<.01). And when the *t*'s between the pre-EX inventory of the CV class and the post-EX in the TV class were examined the same pattern was evident: the TV class found itself more satisfied with TV than the expectations for the CV class indicated. In this case, as noted previously, the lack of equivalence between the TV class and the CV class prior to the start of instruction was, fortunately, not a disadvantage.

When the means for the TV class were examined at the end of each trimester, the *t* test for the difference between means showed that the TV class was stable across-time.

Table 28

THE PRE- AND POST-EX INVENTORIES:
THE MEANS AND *t*'S FOR ACROSS-CLASS AND WITHIN-CLASS
COMPARISONS FOR THE CV AND TV CLASSES:
TRIMESTERS I, II, AND III

	CV		TV	*t*
		Pre-EX Mean		
	64.60		70.34	2.73*
		Post-EX Mean		
Post-EX I	54.29	Post-EX II	53.52	.81
Post-EX I	54.30	Post-EX III	53.67	.63
Post-EX II	53.50	Post-EX III	53.72	.26
		Pre-EX and Post-EX t's		
Pre-EX CV x Post-EX TV I				5.79*
Pre-EX CV x Post-EX TV II				5.84*
Pre-EX CV x Post-EX TV III				5.96*
Pre-EX TV x Post-EX TV I				10.07*
Pre-EX TV x Post-EX TV II				9.43*
Pre-EX TV x Post-EX TV III				10.25*
$t_{.05}=1.992$		$t_{.01}=2.643$	df=76	
$t_{.05}=1.976$		$t_{.01}=2.609$	df=152	

*Significant at the .01 level.

CORRELATION BETWEEN ATTITUDE MEASUREMENTS

Statement of Hypotheses

In order to examine the relationship between attitude measurements two series of null hypotheses were tested. One set dealt with the content of the scales themselves. The second set dealt with correlations of attitude measurements in adjacent trimesters. These hypotheses follow:

1. H_0 Within each class and, further, within each trimester, the zero and first order partial correlation for any pair of attitude measurements is not significantly different from the correlation of any other pair.

   Statistical procedure: Hotelling's *t*.

2. H_0 Within each class, the zero order and first order partial correlation of any given attitude measurements for adjacent trimesters is not significantly different from the correlation for the same attitude measurements for distant trimesters.

   Statistical procedure: Hotelling's *t*.

THE CV CLASS

Presentation of Data

We have scores for three variables on one population. The problem was to determine whether one variable, X, was more highly correlated with Y than with Z. Hotelling's *t* tests for the difference between r_{yz} and r_{xz} without making any assumptions as to the form of the distribution of X or Y in the population. This test also assumed that Z has a normal distribution for each value of X and for each value of Y.

Table 29 shows the zero order correlations between some of the attitude scales for the CV class. The third column of this table lists the *t* for the difference between the two specified correlations on the assumption that $r_{xz}=r_{yz}$. This *t* test, developed by Hotelling, is used with measures of three variables on one population.[2]

Table 30 lists the first order partial correlations for the set of correlations presented in Table 29 and the *t*'s for the difference between the indicated pairs of partial correlations according to Hotelling's method.

Discussion

Correlations between different attitude scales within a trimester.--The VM and LD correlation was not significantly different from the VM and LL correlation for each trimester. This held true for zero order *r*'s and for partials. However, the VM and LD correlation was significantly higher ($p=<.05$) than the LL and LD correlation in each trimester for the partials. There was a higher relation between the VM and LD scale than there was between the LL and LD. Probably the explanation was that in the CV class the LL did his work separately from the four LD's (see page 16); at the same time that VM were linked to the work of the LD they were also linked to the work of the LL. The partials also show that the VM x LL correlation was higher than the LL x LD correlation. In some way, then, in the CV class the VM were linked to both the LL and the LD and the work of the LL and LD were separate.

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[2] Helen Walker and Joseph Lev, *Statistical Inference* (New York: Rinehart and Winston, 1953), p. 257.

Correlations between trimesters within a scale type.—Examination of the partials for LD shows that the Trimester II x III correlation was significantly higher than the Trimester I x III correlation. It is not surprising to find adjacent trimesters more highly related. But what

Table 29

The CV Class:
Zero Order Correlations Between Selected Attitude Measurements and *t*'s for Tests of Significance Between Correlations:
Trimesters I, II, and III

Trimester	Variable	Correlation	*t*
I	VM x LL	.64	.13
	VM x LD	.65	1.63
	LL x LD	.53	
II	VM x LL	.61	1.06
	VM x LD	.51	1.37
	LL x LD	.39	
III	VM x LL	.67	.73
	VM x LD	.72	3.21[a]
	LL x LD	.51	
	LL I x II	.59	2.01[b]
	I x III	.70	1.38
	II x III	.78	
	LD I x II	.37	2.06[b]
	I x III	.53	.86
	II x III	.69	
	VM I x II	.61	.14
	I x III	.60	.68
	II x III	.65	

$t_{.05}=1.992$ $t_{.01}=2.644$ df=74

[a] Significant at the .05 level.
[b] Significant at the .01 level.

is surprising is that the Trimester I x III as well as the Trimester II x III correlations are significantly higher than the Trimester I x II correlation. Apparently there is no relation between student ranking from Trimesters I to II. What accounts for this strange shift, at the same time that the course organization was kept the same, is not known.

Further, this inter-trimester partial correlation pattern was found, in almost identical fashion, for the LL. Apparently, this unknown factor(s) influenced both the LL and LD. This lack of relation between Trimesters I and II for the LL and LD may be related in some way to the significant drop in means for both the LL and LD from Trimesters I to II (Tables 19 and 21, pages 54 and 56). Not only is student judgment becoming less favorable, but different people take over the "favorable" helm.

Table 30

The CV Class:
First Order Partial Correlation Between
Selected Attitude Measurements and *t*'s for
Tests of Significance Between Correlations:
Trimesters I, II, and III

Trimester	Variable	Correlation	*t*
I	VM x LL	.458	.15
	VM x LD	.476	2.64[a]
	LL x LD	.195	
II	VM x LL	.519	1.2
	VM x LD	.372	2.44[b]
	LL x LD	.115	
III	VM x LL	.507	.82
	VM x LD	.592	6.20[a]
	LL x LD	.053	
	LL I x II	.098	4.51[a]
	I x III	.474	1.59
	II x III	.636	
	LD I x II	.007	4.66[a]
	I x III	.408	1.99[b]
	II x III	.626	
	VM I x II	.361	.22
	I x III	.337	.97
	II x III	.448	
$t_{.05}=1.992$	$t_{.01}=2.644$	df=74	

[a] Signficant at the .01 level.
[b] Significant at the .05 level.

Most striking of all, however, is that VM partials show stability across trimesters. Whatever may be held responsible for the LL and LD patterns, it does not obtain for the VM. The VM stability may be due to the fact that it was not part of a unified TV "production."

THE TV CLASS

Presentation of Data

Table 31 shows the zero order correlations between some of the attitude measurements

Table 31

THE TV CLASS:
ZERO ORDER CORRELATIONS BETWEEN SELECTED
ATTITUDE MEASUREMENTS AND *t*'S FOR TESTS OF
SIGNIFICANCE BETWEEN CORRELATIONS:
TRIMESTERS I, II, AND III

Trimester	Variable	Correlation	*t*
I	VM x LL	.42	3.02[a]
	VM x LD	.68	2.28[b]
	LL x LD	.48	
II	VM x LL	.46	2.27[b]
	VM x LD	.64	.48
	LL x LD	.60	
III	VM x LL	.39	5.41[a]
	VM x LD	.79	4.35[a]
	LL x LD	.46	
	LL I x II	.83	4.54[a]
	I x III	.61	2.34[b]
	II x III	.72	
	LD I x II	.59	1.05
	I x III	.52	3.14[a]
	II x III	.74	
	VM I x II	.65	1.87
	I x III	.51	1.61
	II x III	.63	
	Post-EX I x II	.72	1.20
	I x III	.66	2.74[a]
	II x III	.80	

$t_{.05}=1.99$ $t_{.01}=2.644$ df=74

[a] Signficant at the .01 level.
[b] Signficant at the .05 level.

for the TV class. The third column of this table lists the *t* for the difference between the two specified correlations.

Table 32 lists the partial correlations for the set of correlations presented in Table 31 and the *t*'s for the difference between the pairs of first order partial correlations.

Table 32

THE TV CLASS:
FIRST ORDER PARTIAL CORRELATIONS BETWEEN
SELECTED ATTITUDE MEASUREMENTS AND *t*'S FOR
TESTS OF SIGNIFICANCE BETWEEN CORRELATIONS:
TRIMESTERS I, II, AND III

Trimester	Variable	Correlation	*t*
I	VM x LL	.145	4.11[a]
	VM x LD	.600	2.62[b]
	LL x LD	.292	
II	VM x LL	.123	3.74[a]
	VM x LD	.512	.55
	LL x LD	.447	
III	VM x LL	.048	7.68[a]
	VM x LD	.746	4.77[a]
	LL x LD	.269	
	LL I x II	.710	9.43[a]
	I x III	.032	6.74[a]
	II x III	.483	
	LD I x II	.357	2.19[b]
	I x III	.153	4.65
	II x III	.628	
	VM I x II	.492	3.06[a]
	I x III	.170	2.75[a]
	II x III	.456	
	Post-EX I x II	.425	2.46[b]
	I x III	.201	4.33[a]
	II x III	.622	

$t_{.05}=1.992$ $t_{.01}=2.644$ df=74

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[a] Significant at the .01 level.

[b] Signficant at the .05 level.

Discussion

Correlations between different attitude scales within a trimester.—

1. Examination of the partials shows that the VM x LD correlation was higher than the VM x LL relation and higher than the LL x LD relation. This appears to be a way of saying that in the TV class VM were closely linked to the LD and that the VM, in the TV class, were not as closely identified with the LL as they were in the CV class. This is, of course, a reflection of the difference in teaching between the two classes.

One other fact is worthy of note. In Trimester II the VM x LD partial is not higher than the LL x LD partial. This may very well have been tied to the fact that in Trimester II the LL was teaching in the laboratory itself while the LD work was televised. The LL's influence, in this case, may have extended to the televised material.

2. Several additional observations were made.

   The VM and LD partial correlations dropped very little from their zero order *r*'s in comparison with the drop for the VM and LL correlations and for the LL and LD correlations from their own zero order *r*'s. For these latter two sets of correlations, then, the zero order *r* was dependent in the first case upon a relationship with the LD, and in the second case upon a relation with VM. On the face of it, the VM and LL scales had little in common. This held also for the LL and LD scales. The highest partial correlation between VM and LD was found in Trimester III—although no test of significance was available. In this trimester a parallel rise took place in the means for both the LD and VM scales over Trimester II. The rise in both these variables appeared to have been linked.

Correlations between trimesters within a scale type.—Although observation of the zero order correlations in Table 31 showed the correlation between adjacent trimesters to have been higher than trimesters distant in time, Hotelling's *t* for a difference between correlations showed that these differences were significant only for the LL scale ($p=<.01$) when Trimesters I and II were examined. This was striking. But when II and III were the adjacent trimesters, the following scales showed a significant difference: LL, Post-EX, LD.

Examination of the *t*'s, Table 32, for the partials, changed this picture and made it possible to say without qualification that the correlation of adjacent trimesters was significantly higher than the correlation for distant trimesters ($p=<.05$). This was not an unexpected finding. Since there was a change in the nature of the LL's teaching medium in Trimester II, it was interesting how relatively pure the correlation was between the LL for Trimester I and II—the partial dropped to .71 from a zero order *r* of .83—and how contaminated the LL correlation was between Trimesters I and III—it dropped to .03 from .61.

In some way the evaluation of the LL for Trimester III was "filtered through" Trimester II. This appeared to have been a way of saying that some students preferred the LL (Trimester I) strongly and a very similar group of students liked the non-televised LL (Trimester II) almost as strongly. This may have been an estimate of the LL himself apart from the teaching medium.

There is no answer, here, to the question of why the students in the TV class maintained, relatively, the same ranking on the LL scale from Trimester I to II although the LL's medium shifted while in the CV class students did not maintain the same ranking although the LL did not change his medium.

Chapter V

SUMMARY, FINDINGS AND IMPLICATIONS

SUMMARY

The general problem of this study was to compare the grades and attitudes of students taking a course in operative dentistry, half of whom were taught conventionally and half of whom were taught to a large extent via closed circuit television. Twenty-one null hypotheses were tested in order to explore relationships within and between the control group and the experimental group, within and between trimesters, in terms of (1) predicted grades for written work and for practical work, (2) achieved grades for written work and for practical work, (3) attitudes toward the teachers and the teaching of the course, and (4) attitudes toward the use of television in the course.

The problem was thought to be significant because most previous studies of instructional television dealt primarily with conceptual subject matter (e.g., history, general psychology, English literature). These studies concluded, in the main, that there were no differences between CV and TV teaching so far as course examinations go. Some studies, though, dealt with the problems found in dental teaching. In 1955 an Army television study concluded, after three hours of small-parts manipulation training, that television was very useful for this work. In 1956 Tannenbaum compared television lecture-demonstration teaching of post-graduate periodontia with conventional teaching and found that there were no differences between groups. In 1960 Seibert and Honig prepared careful step-by-step laboratory grading check sheets in order to compare CV and TV teaching of two general college chemistry laboratory techniques. They found no differences between groups on laboratory skills. In 1962 Grant compared TV demonstration teaching of one technic in Crown and Bridge Prosthetics with a CV lecture that used slides. Grant used a reliable, pre-tested practical grading method and found no differences between CV and TV teaching.

Although the place of visual exposition in the TV teaching of manual skills seems promising and in some ways secure, neither prior to the start of this study, concurrently with it, nor afterwards did any study examine full-scale instruction for a full academic year of a course whose content was highly "visual" and largely concerned with imparting facility in manual manipulation. Also, no attempt has been made to relate written grades and attitudes to this same problem.

The design of the study was planned jointly by the experimenter and the five faculty members who taught the course in Sophomore Operative Dentistry at New York University, College of Dentistry. Preliminary work was done during the academic year of 1959-1960, and the experiment was conducted throughout the three trimesters of 1960-1961.

There were 170 students in Sophomore Operative Dentistry. Data from foreign and repeat students were not used in the study. One hundred fifty-four subjects—all males, all in their second year of dental school—were divided into two groups of seventy-seven each on the basis of two variables—predicted grades on written work and predicted grades on practical work, i.e., laboratory projects. The two multiple regression equations for predicting these grades were based on data for students taking Sophomore Operative Dentistry in 1959-1960. From the records of these students ten scores were selected—previous grades and aptitude scores on the American Dental Assoociation tests—and correlated with their composite written and composite practical grades in Sophomore Operative Dentistry. The same data on previous grades and aptitude scores were secured for the 154 subjects prior to the beginning of the 1960-1961 course. By use of two multiple correlation equations the ten scores were used to predict the practical and written grades. The *R* was .56 for predicted practical grades and .53 for predicted written grades. In order to obtain a close matching of the experimental and control groups on predicted practical grades which was considered to be the more important variable, a sacrifice had to be made on the other variable. The result was that the control group had a significant advantage ($p=<.05$) on predicted written grades. This difference was compensated for subsequently by use of covariance analysis. The control group is usually identified in this paper as the CV (or conventional) class, and the experimental group is termed the TV (or television) class.

The customary schedule for Sophomore Operative Dentistry was well suited to experimental needs. Each Monday morning the whole class attended a lecture by the senior faculty member, stressing principles and theories. For their other meetings the class was divided into two sections because the laboratory room accommodated eighty-five students. Each section had two three-hour laboratory sessions per week.

In the CV class the teaching format of previous years was retained without change. Each lab session was opened by a lecture stressing practical application, delivered from a platform in the laboratory room by the senior faculty member. Next came demonstrations, showing how to do the day's laboratory project, by four instructors who worked at student desks. Each instructor demonstrated the task twice; thus each demonstration was observed by a semi-circle of about ten students. The students then went to their desks and started working. During the remainder of the session the instructors circulated about the laboratory, observing the students and occasionally answering questions. Each project was divided into a sequence of steps. When a student completed a step he signaled the nearest instructor, who graded and approved the work on a check-off sheet.

In the TV class the following changes were made in the above teaching format. All of the laboratory demonstrators' work was done in the TV studio and thence televised to the laboratory where eight television receivers were strategically located so as to permit convenient viewing from any part of the room. During Trimester I all of the Laboratory Lectures were televised; during Trimester II all were delivered in the laboratory itself; and during Trimester III the lectures were delivered alternately from the control room and in the laboratory.

During 1959-1960 written examinations, objective in type, were developed and pretested, using the Flanagan item-selection technique. Likewise the four laboratory demonstrators worked together to standardize their grading of practical work, developing a new set of check-off sheets. Apparently they were successful, because the standard deviation for practical grades in 1960-1961 was 7.96 as compared with 14.31 for the previous year.

Three scales were developed to measure student attitudes toward the teachers and the teaching of the course. These scales were identified as the LL (Laboratory Lecturer) scale, the LD (Laboratory Demonstrator) scale, and the VM (Visual Materials) scale. A combination of Thurstone and Likert techniques was used in constructing the scales.

A fourth scale was constructed "free hand" to measure student expectations of the use of television in the course. The pre-EX (pre-expectations) inventory was administered at the first class meeting of the year, and the same inventory (with appropriate modification of tense), called post-EX, was administered to the TV class at the end of each trimester.

The average reliability (Kuder-Richardson 20) of all four scale-administrations was .91; the range was .88 to .97.

The faculty members endeavored, of course, to maintain maximum similarity in their teaching of the two groups. In order to test the success of these endeavors, four lessons were observed by four "expert" judges, using a graphic Teacher Rating Scale which included nine categories of teaching performance. These data were examined by means of Fisher's exact probability test. Of a total of thirty-six category-comparisons, three showed significant differences between CV and TV teaching. However, the differences were not all in the same direction and they did not indicate any trend or pattern.

Findings

Findings will be listed according to the statement of hypotheses in Chapter IV.

I. A. 1. CV students had higher predicted written-ability than TV students.

2. There was no significant differences in any trimester between the achieved written grades of the CV and TV classes.

B. 1. CV students were probably not distinguishable from TV students on predicted practical-ability.

2. There was no significant difference in Trimesters I and II between the achieved practical grades of the CV and TV classes.

3. In Trimester III the achieved practical grades in the CV class were significantly higher ($p=<.01$) than in the TV class.

C. 1. Each of the top and middle thirds of predicted written-ability CV students was significantly higher than each of the top and middle thirds of predicted written-ability TV students. The low CV predicted trichotomy was not significantly different from the low TV trichotomy.

2. There was no significant difference between the CV and TV classes on written grades for each trichotomy in each trimester.

D. 1. Both the top and low thirds of predicted practical-ability CV students were not significantly different from the top and low predicted practical-ability thirds of TV students.

2. In both the top and low practical-ability trichotomies, both classes achieved similar grades each trimester.

3. The predicted middle practical-ability third favored the CV class.

4. The middle CV practical-ability trichotomy did as well as the TV group in Trimesters I and II but exceeded them in Trimester III.

II. A. Attitudes toward the LL tended to be more favorable in the TV class than in the CV class; significance levels during the successive trimesters were .10, .07, and .02.

B. Attitudes toward the LD's were very significantly more favorable in the TV class than in the CV class; significance levels for all trimesters were beyond .001.

C. Attitudes toward the VM used in the course were very significantly more favorable in the TV class than in the CV class; significance levels by trimesters were .01, .001, and .001.

III. Predicted grades, written or practical, did not interact with subsequent attitude measurements.

IV. Achieved grades, written or practical, interacted with only a few attitude measurements; there was no trend or pattern in these interactions.

V. A. Pre-EX attitudes toward the use of TV in the course, measured at the beginning of the year before any student knew to which group he would be assigned, were very significantly more favorable ($p=<.01$) in the CV class-to-be than in the TV class-to-be.

B. The initial expectancies of the TV class were very significantly exceeded ($p=<.001$) as the course progressed. The post-EX scores of the TV class for each trimester were very significantly more favorable ($p=<.001$) than the pre-Ex scores of either group.

C. Each trimester, post-EX attitudes in the TV class were significantly higher than pre-EX attitudes in the CV class.

D. Post-EX attitudes in the TV class were constant from Trimester I through Trimester III.

VI. A. 1. In the CV class, both the VM and LL correlation and the VM and LD correlation were significantly higher than the LL and LD correlation each trimester.

2. In the TV class, the VM and LD correlation was significantly higher than the VM and LL correlation each trimester: TV students did not relate the work of LL to the VM in the same way that CV students did.

3. Also in the TV class the VM and LD correlation was significantly higher than LL and LD correlation in Trimesters I and III only. For these two trimesters CV and TV students were similar. For Trimester II, however, the VM and LD correlation for TV students was significantly higher than the LL and LD correlation.

B. 1. In the CV class, the partial correlation of the LD scale for Trimesters I x III (distant trimesters) was significantly higher ($p=<.01$) than the partial correlation for Trimesters I x II. The partial correlation for Trimesters II x III was significantly higher ($p = < .05$) than the partial correlation for Trimesters I x III.

2. In the CV class, the pattern for inter-trimester partial correlation for the LL scale was similar to the LD inter-trimester partial correlation except that the partial correlation for Trimesters II x III was higher than the Trimesters I x III partial correlation but not at the .05 level.
3. In the CV class, the inter-trimester partial correlations for the VM scale, between trimesters, were not differentiated from one another.
4. In the TV class, the partial correlation between each of the three attitude scales—VM, LL, and LD—was significantly higher within its scale type in an adjacent trimester than with the same scale type in a distant trimester.

Discussion

The finding that there was no significant difference on written grades themselves between the CV and TV classes is consistent with many previous similar studies. However, in this case the TV class did as well as the CV class, despite the fact that the latter group was favored at the start in terms of matching on predicted written grades. Thus, in effect, the TV class did better than expected on written work. This achievement was probably due at least partly to the operation of many factors (customary in studies of this type) which tend to equate grades on written work, e.g., the joint lecture meetings, the use of a common textbook, and the usual out of class student activities such as sharing notes, discussing assignments, et cetera.

The findings regarding grades on practical work are more difficult to interpret. Why were the practical grades during Trimester III significantly higher in the CV class than in the TV class? One possible explanation is that television instruction was adequate for the earlier and easier projects but less adequate for the later and more difficult projects. Another possible explanation is that the TV class suffered some confusion due to the fact that during the third trimester the laboratory lectures were given alternately from the control room and the platform. Such explanations assume, however, that the TV grades declined in the third trimester; Table 9 shows that this was not the case. The data show that the TV grades for the third trimester were practically the same as for the first and 2.3 points higher than the second trimester, while the CV grades for the third trimester were 3.18 points higher than the first and 4.31 points higher than the second trimester. Thus the TV grades did not go down; rather, the CV grades went up sharply. The question became whether or not the practical grades in a conventionally taught class customarily showed a significant third trimester upturn. Therefore, grades for the previous year were analyzed. No such customary third trimester upturn was found. In 1959-1960 the mean for the second trimester was 80.5, which *fell* to 76.6 in the third trimester. Apparently some unusual and unknown independent variable was at work in the CV class during the third trimester of 1960-1961, a variable which was not operative in the TV class.

Findings II, A, B and C show a remarkably consistent trend—in seven of the nine comparisons (Tables 18, 20, 22) the TV class attitudes were more favorable than the CV class attitudes toward the teachers and the teaching of the course. Two of these differences did not quite reach the .05 level of confidence; most of the others were beyond the .001 level.

The two non-significant differences were on the LL scale. These two smaller differences appear to be partly a function of the fact that the laboratory lecturer was rated highly by both groups. The theoretical scores on the LL scale are as follows:

Perfect	192
Average	112
Worst	32

Table 18 shows that the lowest score for LL was 133.9, which is far above the "average." Roughly speaking, the CV ratings of the lecturer were "high" and those of the TV students were "even higher." A wider range of attitude means was provided on the LD and VM scales. The theoretical scores for both scales are as follows:

Perfect	108
Average	63
Worst	18

Even so, only two of the twelve LD and VM means were "average"—the remaining ten being in the "good" to "very good" levels. These LL, LD, and VM attitude results apparently suggest that both groups were well satisfied with the teachers (especially the senior lecturer) and the teaching of the course, and the TV students were significantly the happier of the two groups.

Similar findings are shown in Table 28, where the data on attitudes toward the use of television in the course are presented. In reading this table it must be remembered that the scoring system is reversed, i.e., the lower the score the more favorable it is. The theoretical scores on these pre-EX and post-EX scales are as follows:

Perfect	25
Average	75
Worst	124

No pre-experiment attempt to equate the two groups on their television expectancies was possible in this study. Table 28 shows that randomness did not prevail—the CV group was initially more favorable ($p=<.01$) toward television than was the TV group. This turned out to be a favorable imbalance since it sharpened the contrast between the pre- and post-expectations of the TV class. Table 28 suggests that both groups began with above average expectations in favor of television; after one trimester of experience, the TV students indicated that instructional television had far exceeded their initial expectations ($p=<.001$) and had likewise exceeded the higher expectations of their colleagues in the CV section. Roughly speaking, the TV students moved from an initial "cautiously above average" attitude to a "definitely far above average" attitude toward the use of television in the operative dentistry course.

The finding that predicted grades did not interact with attitude measurements was expected. There is no apparent reason why predicted grades should predetermine subsequent attitudes toward the way by which a course is taught. Fortunately, expectations were sustained. Had results been otherwise, the validity of the predictive grade tests and of the subsequent attitude tests would have been in serious question.

The finding that achieved grades did not interact with attitude measurements was not expected. It seems logical to expect that more favorable attitudes toward a course should usually be coincident with higher grades, and vice versa. The small amount of interaction in this experiment may have been due to the fact that range of grades and the range of attitudes were both limited. As pointed out above, both of the subject groups appear to have had quite favorable attitudes toward the course; both groups were perhaps strongly motivated. The difference between "strong" and "stronger" attitudes may not be great enough to provide a clear-cut distinction between the grades for two groups that have been matched on the latter variable.

IMPLICATIONS

Future studies should concern themselves with comparing different methods of teaching digital skills via TV. An attempt should be made to discover whether certain TV teaching methods are suited to specific dental technics. Of course, an attempt should be made to discover whether certain technics, or certain aspects of these technics, are more suitably handled without TV. Also, future studies should examine the suitability of different teachers for TV teaching.

The LL, LD and VM scales were constructed by combining Thurstone and Likert techniques. The source of the first step Thurstone items were students who had little or no TV teaching experience. Although the final scales met usual reliability standards, there is no way of knowing how valid the original pool of items was for TV teaching. A similar pool of items secured from a group of students who had several years of TV teaching might have focused on different aspects. The present scales might well have omitted material of importance to a TV audience. Present findings must be viewed with this limitation in mind.

The most important factor in determining choice of an item within each of the three arbitrary content categories was internal consistency. Future studies should attempt to secure items that examine specified problems of TV teaching. In addition, construction of scales via factor analysis would remove the arbitrariness in the three content categories used here.

Examination of the multiple correlation equations shows, also, that some of the variables are not of much value as predictors. The multiple correlation equation may well have been improved by dropping some of the independent variables. Further studies should attempt to improve predictive efficiency.

So far as teaching "lecture material" via TV is concerned, this study offers no evidence against its use for any ability level. This is in accord with results of many other studies covering "lecture teaching" of other courses and at other grade levels. So far as the teaching of "visual materials" is concerned, the results of this study are ambiguous. For the first two trimesters no evidence is offered against use of TV for any ability level. However, in Trimester III an ability interaction appeared for the middle trichotomy in favor of CV teaching. But there is no way of separating some of the variables that may be responsible for the production of this effect in Trimester III. For this reason, future studies should examine this variable again, and more carefully. Perhaps an across-college study would be helpful in this respect.

Appendix A

TELEVISED DENTAL LESSONS: SOPHOMORE OPERATIVE DENTISTRY 1960-1961

Trimester I

1. Sectioning of Teeth: Drawings. Chapter reading from textbook. Discussion of Work-Card.
2. Tooth Morphology. Muscles of mastication; cavity classifiction.
3. Kit Distribution and set up of instrument case.
4. Levers—forces and stresses. Assign Class I outline form on 3X plaster teeth and drawing book.
5. Mortise form—cavity nomenclature.
6. Discussion of enamel, rests, grasps and guard—carving Class I on plaster teeth.
7. Laboratory table set up. Care of handpiece and contra angle.
8. Class I technique. Preparation of Class I natural teeth. Rotary.
9. Continue preparation Class I.
10. Instrumentation, Class I. Natural teeth.
11. Instrumentation, large Class I.
12. Class II theory—Class II carvings and preparation. $\overline{6|}$MO.
13. Class II DO.
14. Zinc phosphate cement—chem. and technic.
15. Exclusion of moisture—rubber dam.
16. Application of zinc phosphate cement—technic.

Trimester II

1. Instrument sharpening.
2. Amalgam—trituration—insertion technic single surface.
3. Continue with compound cavities and ivory matrix No. 1 $\overline{6|}$MO.
4. Continue with various types of amalgam matrices.
5. Class V preparation.
6. Upper jaw instrumentation—rotary rectilinear.
7. Seamless copper band matrix—festooning and application.
8. Disto—lingual step—upper molars.
9. Gold foil armamentarium and technic—Class V.
10. Continue technic Class I. Polishing Class I and V GF.

TRIMESTER III

1. Class III—steps in cavity preparation.
*2. Class III Gold Foil Insertion—technic.
*3. Silicate mixing and insertion—technic.
4. Preparation Class II G.I. of $\overline{7|}$, $\overline{5|}$.
5. Gold Inlay technic for wax pattern—direct.
*6. Gold Inlay technic for wax pattern—indirect.
7. Acrylic. Technic for mix and insertion—brush technic and matrix technic.

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*Laboratory lecture and laboratory demonstration both over television—see page 22.

Appendix B

A TELEVISION PRODUCTION SCRIPT: SOPHOMORE OPERATIVE DENTISTRY 1960-1961

RUBBER DAM PLACEMENT – TRIMESTER I

Camera	*Lens Opening*	
2	3"	1. Laboratory Lecturer–Introduction
4		2. Slides (3 slides rubber dam)
4		3. Rubber Dam Film (color)
4		4. Slides–Armamentarium
2	6"	5. Turntable–Rubber Dam Clamps
1	1"	6. Vu-Graph–Marking of Rubber Dam
2	6"	7. At manikin jaw–cutting of dam
2	3"	8. Working Table–Marking of Dam
		Laboratory Demonstrator
		A. Rubber Dam Punch
2	6"	B. Inserting Clamp
		C. Placing on Tooth
		D. Frame
		E. Tension
1	6"	F. Dental Floss
2	6"	G. Correct Dam Placement
		H. Removal of Dam
		1. Black's Knife
		2. Interproximal
		3. Forceps in holes of clamp or outside of holes
1	6"	4. Total removal
2	3"	9. Laboratory Lecturer–Summary

Start: 2:45 P.M. Finish: 3:40 P.M.

Appendix C

PREDICTED WRITTEN AND PREDICTED PRACTICAL GRADES FOR CV AND TV STUDENTS

CV Students

Student Ident. No.	Predicted Written Grade	Predicted Practical Grade
1	140.2417	155.5255
2	145.9357	158.1080
3	141.8327	142.9910
4.	146.9294	152.0050
5	151.9560	155.0235
6	153.6438	163.8615
7	146.4926	148.0745
8	136.7454	141.9310
9	143.8311	150.0335
11	146.0170	154.8725
12	148.3595	152.6085
13	157.8217	165.8530
14	156.1890	169.4160
15	139.8356	148.9130
16	145.4958	148.8170
17	149.1612	144.3950
19	150.8687	160.5840
20	154.5146	172.7225
22	139.2639	143.2225
23	153.1884	153.7230
24	152.2544	164.1510
25	161.9356	163.3130
26	157.5364	161.3255
27	148.4246	155.3625
28	149.9481	157.6225
29	149.2894	153.0670
30	146.7446	152.2690
31	158.1350	145.3665
32	144.6136	156.3650
33	142.5036	155.8765
34	155.7016	171.5245
35	155.8665	163.2185
36	150.1981	147.8800
37	137.7715	159.0995
38	150.7686	154.2585
39	146.7447	158.2155
40	151.8749	160.5545
41	147.2576	156.6150
42	147.8511	153.4195
43	142.3226	150.8060
44	152.5404	163.3505
45	144.1901	153.9540
46	144.7335	145.4075
47	147.1830	147.1620
48	142.2006	152.8815
49	167.4297	172.1030
50	150.3833	158.3515
51	147.3325	156.1750
52	153.6841	164.9500
53	152.2918	156.5980
54	153.2273	160.0340
55	145.9680	149.9170
56	144.7978	153.5160
57	147.6686	157.4905
58	141.4946	146.1980
59	144.0378	148.6475
60	149.5055	154.4255
61	139.3716	134.2575
62	142.2845	146.0300
63	155.8470	154.3380
64	158.0363	167.4355
65	151.7340	154.2625
66	150.6893	147.0090
67	142.5954	159.5745
68	165.2357	173.7300
69	157.6093	164.6705
70	154.4855	156.8885
71	150.9778	162.1560
72	146.1175	150.7705
73	152.9950	159.4185
74	157.6788	156.3545
75	164.6212	178.5515
76	150.8328	166.8925
77	154.5487	156.8800
78	154.5371	160.8950
79	149.8293	161.6120
80	146.9270	156.3940

TV STUDENTS

Student Ident. No.	Predicted Written Grade	Predicted Practical Grade
86	145.4587	156.5370
87	141.9746	151.0795
88	140.5734	158.2325
89	139.5012	167.3790
90	150.5237	166.3360
91	147.0777	155.3440
92	140.6425	149.5785
93	143.8626	142.5885
94	145.6490	164.9795
95	136.1594	144.5165
96	148.5186	158.4985
97	147.7925	143.4625
98	144.4080	152.4740
99	149.6094	172.2165
100	142.9929	157.0625
102	143.1118	150.0010
103	149.6208	145.4020
104	132.6943	154.0780
106	149.1322	157.9580
107	136.6085	139.9575
108	149.2720	155.7945
109	168.3504	174.8810
110	158.1952	173.2220
111	152.1826	155.0915
112	158.3506	162.8930
113	148.0770	149.3975
114	159.5511	160.8810
115	146.9693	145.6740
116	150.2497	153.3415
117	139.1145	152.4425
118	163.2826	175.8785
119	142.7042	144.6650
120	150.8694	153.7585
121	145.3430	169.0760
122	145.4975	161.3770
123	148.2845	151.9835
124	148.7632	160.7485
125	151.5735	169.4210
126	144.4769	146.1545
127	147.7112	162.9055
128	144.6702	160.9265
129	136.8717	148.1850
130	150.9887	156.3905
131	147.1408	157.2110
132	142.0681	150.5580
133	149.9116	151.1880
134	146.7097	154.4580
135	155.4320	148.9060
136	142.1850	150.6335
137	141.9911	142.4850
138	147.8586	173.9770
139	150.3561	155.4085
140	147.3210	145.4720
141	149.9420	158.9990
142	142.0873	155.1075
143	143.4520	150.0150
144	149.7246	165.1120
145	143.9230	143.8745
146	144.6466	145.1325
147	145.4855	157.2374
148	155.9090	164.6285
149	145.5076	147.6190
150	146.2602	150.4460
151	147.5408	145.4950
152	150.5849	162.3690
153	154.2512	162.5745
154	145.2840	157.8590
155	144.3944	152.1280
156	150.5832	161.0505
157	149.0266	159.7010
158	142.4782	154.7085
159	146.4522	148.7785
160	148.8248	154.3990
161	144.7035	142.7935
162	153.9647	170.3660
163	140.2268	160.0125
164	149.8042	147.3040

Appendix D

REVISED SOPHOMORE OPERATIVE DENTAL WEIGHTED LABORATORY GRADING SHEET
1960-1961

⌊4 CLASS I PREPARATION, PLUGGING, AND POLISHING OF GOLD FOIL

	Assigned Score	Student Score
Management		
1. Cleanliness and Gown	1	
2. Table and Instrument Arrangement	1	
3. Kit	1	
4. Set Up and Rubber Dam Placement	1	
5. General Impression	1	
	5	
Preparation		
1. Outline Form	10	
2. Retention Form	5	
A. Line Angle		
B. Walls		
3. Depth	5	
A. Cement		
	20	
Plugging		
1. Retention of Foil	5	
2. Condensation	20	
3. Marginal Coverage	10	
4. Contour	15	
	50	
Polish		
1. Contour	10	
2. Cavo-Surface	5	
3. Degree of Polish	10	
A. Pitted		
B. Flaky		
	25	
Total	*100*	

Appendix E

LABORATORY LECTURER SCALE

1. The laboratory lecturer's point of view in dentistry is limited.
2. The laboratory lecturer is vitally interested in his work.
3. The laboratory lecturer does not sound "canned" and he is spontaneous and lively.
4. The laboratory lecturer tries to bluff.
5. The laboratory lecturer undermines my self confidence.
6. The laboratory lecturer is a good teacher.
7. I follow instructions of the laboratory instructor but I do not really understand him.
8. I imagine the laboratory lecturer is a good dentist.
9. The laboratory lecturer leaves ideas up in the air.
10. The laboratory lecturer teaches vividly.
11. The laboratory lecturer has a keen intellect.
12. The laboratory lecturer never gets to the heart of a topic.
13. The laboratory lecturer uses excellent lecture material.
14. The laboratory lecturer cannot put his material over.
15. The laboratory lecturer has a broad knowledge of dental problems.
16. The laboratory lecturer answers questions skillfully.
17. The laboratory lecturer lacks rapport with the class.
18. I feel at ease during the laboratory lecture period.
19. The laboratory lecturer doesn't make you want to do your best.
20. The laboratory lecturer talks too much.
21. The laboratory lecturer is belligerent.
22. The laboratory lecturer is interesting.
23. The laboratory lecturer complicates simple things.
24. The laboratory lecturer makes difficult problems clear.
25. The laboratory lecturer is interested in our progress.
26. The laboratory lecturer is a hypocrite.
27. Question answering procedure during laboratory lecture works out well.
28. The laboratory lecturer makes you feel he wants to help you.
29. The laboratory lecturer does a thorough job.
30. The laboratory lecturer just draws his salary.
31. The laboratory lecturer does not organize his material logically.
32. The laboratory lecturer is patient with the class.

Appendix F

LABORATORY DEMONSTRATOR SCALE

1. Demonstration clears up procedures that I am confused about during a verbal lecture.
2. I have a good set of notes on how to carry out a procedure.
3. Demonstrations of operative procedure do not go off smoothly.
4. The demonstrator is patient.
5. There is too much demonstration work to absorb at one time.
6. It is easy for me to observe demonstrations.
7. I can see fine detail during the demonstrator's work.
8. I have an exact idea of how to *use* my instruments for each step of a procedure before beginning my practical work.
9. I feel I can carry through my practical work successfully as I listen to the demonstrator.
10. The demonstrator points out intricate details easily.
11. We have sufficient demonstrations of operative procedure.
12. Because of my angle of vision when observing a demonstration, it is difficult for me to imagine myself carrying out the procedures.
13. I can not see each step in the demonstrations of operative procedure.
14. The demonstrator does not work slowly enough for me to follow.
15. The demonstrator has the right materials and necessary equipment handy.
16. I feel crowded while watching a demonstration.
17. The demonstrator does not set an example for us to follow.
18. I see large scale manipulations by the demonstrator clearly.

Appendix C

VISUAL MATERIALS SCALE

1. I cannot ask questions about the film.
2. Visual materials are in poor condition.
3. Visual materials are not explained; we simply see them.
4. The laboratory lecturer does nothing more than run the film; he does not discuss it.
5. Visual materials do not help me understand hand and finger positioning for various procedures.
6. I can touch and examine physically various models and specimens.
7. Each step of a procedure is illustrated.
8. Something often goes wrong with the visual materials.
9. Visual materials are not carefully tied to the laboratory lecture.
10. The laboratory lecturer does not erase the blackboard of the vu-graph until we have copied the material.
11. I see models and specimens from many angles.
12. Sketching on the blackboard or vu-graph is not done well.
13. Different anatomical areas are not made clear by means of the visual materials.
14. I see large-scale illustrations of small details.
15. I have enough time to study the various visual materials.
16. Visual materials are not prepared ahead of time.
17. I feel the visual materials are of value in explaining principles and procedures.
18. I do not see large models clearly.

Appendix H

PRE-EXPECTANCY INVENTORY

1. *Paying Attention.* In comparison with regular instruction, I expect paying attention in a televised class of operative technic would be:
    1. Much more difficult.
    2. Difficult.
    3. About the same.
    4. Easier.
    5. Much easier.

2. *Amount of Work.* In comparison with regular instruction, I expect that in a televised class of operative technic I would do:
    1. Much less work.
    2. Less work.
    3. Approximately the same amount of work.
    4. More work.
    5. Much more work.

3. *Amount of Studying.* In comparison with regular instruction, I expect that in a televised class of operative technic I would study:
    1. Much less.
    2. Less.
    3. About the same amount.
    4. More.
    5. Much more.

4. *Personal Preference.* The following best describes my personal preference about being placed in a televised class of operative technic:
    1. I am very much opposed.
    2. I am opposed.
    3. It makes no difference to me.
    4. I am in favor.
    5. I am very much in favor.

5. *General Sucess.* Teaching operative technic via television, *full-scale*, is new at this school. In comparison with regular instruction, I expect the television class would work out:
    1. Very poorly.
    2. Poorly.
    3. About the same.
    4. Well.
    5. Very well.

6. *Principle and Theory.* In comparison with regular instruction, I expect that in a televised class of operative technic I would learn:
    1. Much less about principles and theory.
    2. Less about principles and theory.
    3. Approximately the same about principles and theory.
    4. More about principles and theory.
    5. Much more about principles and theory.

7. *Class Interest.* In comparison with regular instruction, I expect a televised class of operative technic would be:
    1. Much less interesting.
    2. Less interesting.
    3. About as interesting.
    4. More interesting.
    5. Much more interesting.

8. *Question-Answering Procedure.* In comparison with regular instruction, I expect the procedure for asking and answering questions in a televised class of operative technic would be:
    1. Very poor.
    2. Poor.
    3. About the same.
    4. Better.
    5. Much better.

9. *Observing Demonstrations.* In comparison with regular instruction, I expect I would be able to observe demonstrations of operative technic in a televised class:
   1. Very poorly.
   2. Poorly.
   3. In about the same way.
   4. Well.
   5. Very well.

10. *Personal Contact with Instructor.* In comparison with regular instruction, I expect the change in personal contact with the instructor in a televised class of operative technic would be:
    1. Very unsatisfactory.
    2. Unsatisfactory.
    3. Of no importance.
    4. Satisfactory.
    5. Very satisfactory.

11. *Speed of Class.* In comparison with regular instruction, I expect a televised class in operative technic would move:
    1. Very slowly.
    2. Slowly.
    3. At about the same speed.
    4. Quickly.
    5. Very quickly.

12. *Technical TV Difficulties.* In a televised class of operative technic, I expect technical difficulties arising from use of television equipment itself would be:
    1. A great disturbance.
    2. A disturbance.
    3. Of no practical significance.
    4. There would be no technical difficulties.

13. *Educational TV.* So far as education, *in general,* via television is concerned.
    1. I am strongly opposed.
    2. I am opposed.
    3. I have no feelings one way or the other.
    4. I am in favor.
    5. I am strongly in favor.

14. *Ease of Learning.* In comparison with regular instruction, I expect that in a televised class of operative technic I would learn:
    1. With great difficulty.
    2. With difficulty.
    3. In about the same way.
    4. More easily.
    5. Much more easily.

15. *Note Taking.* In comparison with regular instruction, I expect the notes I would take in a televised course would be:
    1. Very poor.
    2. Poor.
    3. About the same.
    4. Better.
    5. Much better.

16. *Course Organization.* In comparison with regular instruction, I expect a televised class of operative technic would be organized:
    1. Very poorly.
    2. Poorly.
    3. About the same.
    4. Well.
    5. Very well.

17. *Novelty.* So far as the novelty factor is concerned, the following best describes how I would feel about being in a televised class of operative technic:
    1. I am very much opposed.
    2. I am opposed.
    3. It makes no difference to me.
    4. I am in favor.
    5. I am very much in favor.

18. *Verbal Instruction.* In comparison with regular instruction, I expect the verbal lecture material in a televised class of operative technic would be taught:

    1. Very poorly.
    2. Poorly.
    3. In about the same way.
    4. Well.
    5. Very well.

19. *Demonstration Work.* In comparison with regular instruction, I expect the demonstration work in a televised course of operative technic would be taught:

    1. Very poorly.
    2. Poorly.
    3. In about the same way.
    4. Well.
    5. Very well.

20. *Adusting to TV Class.* To be a student in a television class would be new to me. I expect I would take to it:

    1. Very badly.
    2. Badly.
    3. About the same way I do a regular class.
    4. Well.
    5. Very well.

21. *TV Impact.* In comparison with regular instruction, I expect the impact, or impression, of a televised class of operative technic would be:

    1. Much weaker.
    2. Weaker.
    3. About the same.
    4. Stronger.
    5. Much stronger.

22. *Being in an Experiment.* The following best describes my personal feeling about being part of an experiment in the teaching of operative technic:

    1. I am very much opposed.
    2. I am opposed.
    3. It makes no difference to me.
    4. I am in favor.
    5. I am very much in favor.

23. *Faculty Preparation.* In comparison with regular instruction, I expect that in a televised class of operative technic the faculty would be:

    1. Very poorly prepared.
    2. Poorly prepared.
    3. Prepared in about the same way.
    4. Well prepared.
    5. Very well prepared.

24. *Quality of Practical Work.* In comparison with regular instruction, I expect that in a televised class of operative technic the quality of my practical work would be:

    1. Much poorer.
    2. Poorer.
    3. Approximately the same.
    4. Better.
    5. Much better.

25. *Use of Visual Materials.* In comparison with regular instruction, I expect visual materials—charts, movies, specimens, slides, models, etc.—in a televised class of operative technic would be used:

    1. Much less effectively.
    2. Less effectively.
    3. In about the same way.
    4. More effectively.
    5. Much more effectively.

Appendix I

QUALIFICATIONS OF JUDGES FOR TEACHER RATING SCALE

TRIMESTER II

First set of four judges

1. Assistant Professor in Education at a university. Supervised practice teaching in the elementary schools.
2. Lecturer in Education at a local college, teaching a course in the methods of teaching in the elementary school.
3. Supervised teachers as a principal in several elementary schools. Served as a teaching assistant in a graduate course in Supervision and Methods.
4. Formerly Assistant Professor of Operative Dentistry, College of Dentistry, New York University. Presently Director, Guggenheim Dental Clinic, New York City. Fellow, American College of Dentists.

TRIMESTER III

Second set of four judges

1. Assistant Professor of Education at a local college and Supervisor of Student Teachers in Science.
2. Professor in the New York State Department of Education Industrial Teacher Training Program—concerned with teaching trade and technical subjects.
3. Professor of Education in a local college. Supervisor of Student Teaching.
4. Professor of Education specializing in higher education. (Substitute judge)
5. Formerly Instructor, Operative Dentistry, College of Dentistry, New York University. Instructor in Post-Graduate courses at the First District Dental Society.

Appendix J

ACHIEVED WRITTEN AND ACHIEVED PRACTICAL GRADES FOR CV AND TV STUDENTS

CV STUDENTS

Student Ident. No.	Achieved Written Grade			Achieved Practical Grade		
	I	II	III	I	II	III
01	76	69	75	77.5	81	80
02	81	67	75	68.5	74	82
03	84	66	61	63.0	73	75
04	86	75	77	72.0	74	83
05	81	73	73	78.5	76	83
06	84	81	83	83.5	78	85
07	87	66	78	88.0	80	80
08	80	68	75	86.0	77	80
09	75	67	66	73.0	76	80
11	80	65	76	88.5	77	80
12	74	83	67	77.0	76	78
13	85	62	72	87.5	77	86
14	79	78	67	85.0	82	82
15	69	72	63	71.0	73	77
16	74	64	76	78.0	81	77
17	79	66	74	54.5	70	77
19	90	66	80	88.0	81	83
20	76	75	75	82.0	86	91
22	77	66	56	60.0	73	70
23	80	72	82	72.5	77	84
24	75	64	80	80.0	83	84
25	86	83	81	86.0	83	86
26	80	71	74	81.0	78	85
27	76	74	79	87.5	79	85
28	87	77	79	82.0	77	81
29	84	79	72	73.5	74	84
30	77	71	73	93.5	78	88
31	84	77	77	57.0	70	79
32	82	71	72	91.5	85	81
33	83	66	83	88.0	74	82
34	85	73	84	94.0	91	87
35	80	83	86	89.0	80	85
36	87	82	83	51.2	68	81
37	77	57	71	82.0	78	86
38	77	72	75	88.5	86	85
39	85	70	69	74.0	79	88
40	83	74	89	85.0	76	78
41	80	69	85	89.0	86	88
42	87	67	77	73.0	76	80
43	76	75	73	70.5	78	84
44	83	65	80	92.5	77	86
45	76	74	77	73.0	81	84
46	89	77	77	85.0	75	83
47	84	70	81	77.5	74	83
48	75	66	74	84.5	74	85
49	82	81	91	75.0	85	89
50	81	58	86	72.0	72	83
51	70	66	79	74.9	76	77
52	87	77	83	87.0	83	83
53	83	72	79	83.5	74	78
54	75	72	84	84.0	82	90
55	78	79	80	68.0	72	74
56	85	73	72	64.0	73	72
57	85	73	84	80.0	82	83
58	84	67	69	79.5	75	82
59	84	64	65	73.5	74	75
60	76	68	73	79.0	73	79
61	80	61	79	68.5	72	88
62	88	76	80	64.5	77	77
63	82	75	84	77.5	77	78
64	80	86	81	90.5	79	86
65	75	67	84	86.0	80	82
66	78	78	84	61.0	74	85
67	82	73	68	80.5	73	75
68	88	85	92	92.5	84	90
69	73	81	83	86.5	78	84
70	85	71	83	71.5	82	84
71	80	58	79	90.5	85	88
72	86	76	81	84.0	74	79
73	86	74	80	78.5	82	83
74	84	74	85	82.5	86	83
75	79	79	85	84.0	81	85
76	80	68	61	82.0	82	85
77	75	76	81	82.5	83	82
78	91	84	85	77.5	72	79
79	89	68	80	75.0	75	76
80	81	67	73	84.5	77	83

TV Students

Student Ident. No.	Achieved Written Grade			Achieved Practical Grade		
	I	II	III	I	II	III
086	86	69	65	69.5	85	82
087	81	68	73	88.0	73	73
088	84	70	78	81.5	74	82
089	72	73	73	85.5	80	85
090	87	70	71	90.5	80	83
091	80	70	73	74.5	76	82
092	75	57	64	80.5	73	76
093	58	49	80	67.5	73	78
094	80	67	83	83.0	84	84
095	79	56	75	67.0	76	82
096	81	66	77	80.5	78	75
097	81	57	77	80.5	75	82
098	82	75	70	68.0	76	83
099	84	66	74	89.5	91	84
100	81	65	75	90.0	79	77
102	82	77	74	81.0	80	83
103	87	66	75	79.0	79	75
104	83	65	69	71.5	80	73
106	84	75	75	91.0	79	80
107	80	74	75	56.5	71	82
108	75	80	77	82.5	76	69
109	85	78	88	84.5	86	86
110	86	80	79	79.5	82	84
111	80	77	80	86.0	71	73
112	86	73	86	81.0	81	89
113	85	79	75	79.0	79	81
114	84	79	80	78.5	80	84
115	81	76	79	74.5	77	87
116	72	80	87	90.5	79	79
117	79	73	75	83.0	73	78
118	87	79	85	92.0	83	87
119	85	68	77	75.0	79	73
120	81	75	77	86.5	80	78
121	79	54	77	77.5	79	84
122	72	75	72	80.0	80	82
123	84	68	79	83.0	77	79
124	78	68	64	93.0	87	85
125	89	75	82	94.0	84	85
126	89	67	75	84.5	73	80
127	77	63	75	96.0	82	77
128	87	77	79	89.0	83	92
129	81	68	78	82.0	77	79
130	79	74	80	81.5	78	82
131	89	74	74	80.5	78	80
132	85	72	79	68.5	71	74
133	91	73	81	79.5	76	81
134	86	72	80	80.0	76	79
135	77	70	81	89.5	74	80
136	80	67	72	70.0	74	73
137	75	65	74	79.5	77	75
138	83	77	80	86.0	83	81
139	79	74	82	86.0	72	82
140	79	71	77	66.0	67	70
141	74	70	72	79.5	78	77
142	72	71	82	88.0	77	76
143	86	67	70	75.0	67	75
144	84	79	74	88.0	80	77
145	82	76	73	60.5	73	77
146	80	76	70	66.5	79	78
147	76	70	71	87.0	72	83
148	82	76	70	90.5	85	88
149	67	71	80	62.0	76	81
150	82	74	77	81.5	70	79
151	94	80	78	71.5	72	76
152	84	71	91	84.0	80	83
153	81	82	86	88.5	85	85
154	82	73	79	81.5	76	76
155	81	71	80	73.5	75	77
156	74	72	80	75.0	85	82
157	83	79	82	80.5	74	80
158	75	77	82	83.5	80	79
159	83	74	83	81.0	77	81
160	83	79	71	75.0	76	80
161	83	71	80	71.0	78	84
162	84	70	78	85.0	82	85
163	81	73	82	86.5	78	81
164	84	76	77	61.5	75	74

Appendix K

ATTITUDE SCORES OF CV STUDENTS

(Legend Identifying Scales Follows Data)

Student Ident. No.	1	2	3	4	5	6	7	8	9	10
01	121	71	69	*J36	68	70	J26	64	83	66
02	J58	90	95	J13	62	59	J47	66	81	70
03	J54	62	53	J36	38	48	J34	53	61	62
04	J08	66	78	094	55	74	J04	52	67	66
05	J63	93	02	J66	98	97	J66	96	99	79
06	J53	77	90	J42	68	77	J52	80	83	58
07	J72	61	75	J22	61	85	J74	63	92	62
08	J23	62	74	J35	83	75	J23	65	78	53
09	J16	60	66	J49	69	87	J37	62	65	57
11	J52	48	72	082	31	49	096	59	69	68
12	J56	70	81	J36	72	78	J58	70	84	59
13	J49	87	91	J30	60	72	J29	74	74	75
14	J49	80	86	J41	47	63	J32	52	57	76
15	J45	61	75	J37	40	66	J48	51	71	60
16	J35	45	81	J00	37	67	J12	49	68	70
17	J78	67	92	J75	60	95	J71	64	88	64
19	J38	84	90	J30	43	92	J43	52	81	65
20	J82	81	78	J80	67	84	J89	79	87	53
22	J33	53	72	J47	52	68	J47	47	70	88
23	J36	40	58	J63	61	80	J69	60	78	65
24	J35	72	73	J46	66	72	J29	58	63	53
25	J38	59	67	J48	45	72	J27	52	61	77
26	J14	80	55	096	46	35	J00	66	63	88
27	J18	53	70	J05	66	91	J02	44	61	52
28	099	50	43	J02	33	49	074	30	45	39
29	J36	60	79	J63	37	66	J33	38	57	52
30	092	41	45	J19	74	52	093	55	55	68
31	J37	70	88	J46	41	77	J26	61	84	89
32	J77	81	69	J02	62	46	J17	64	67	60
33	J15	54	65	J09	68	66	J15	56	61	63
34	J47	72	65	J35	62	68	J45	61	65	64
35	J68	57	71	J48	63	66	J47	48	63	59
36	J55	65	86	J32	52	90	J39	72	86	61
37	J57	57	69	J56	63	72	J59	60	75	66
38	J13	42	62	J40	40	53	J14	49	55	66
39	J37	39	74	J61	83	91	J53	84	90	49
40	J60	66	75	J56	65	77	J51	60	81	62
41	J56	86	80	J55	92	90	J59	73	90	73

*J=1; therefore J36 is to be read as 136, etc.

ATTITUDE SCORES OF CV STUDENTS (continued)
(Legend Identifying Scales Follows Data)

Student Ident. No.	1	2	3	4	5	6	7	8	9	10
42	J13	66	49	J16	74	62	J16	69	59	46
43	J64	75	83	J64	60	83	J40	53	55	68
44	J04	64	56	096	50	67	095	53	68	55
45	J55	92	84	J35	66	78	J57	71	84	
46	J56	78	93	J59	53	82	J51	62	77	55
47	J35	53	88	J30		85	J21	72	72	57
48	J60	70	82	J56		92	J36	54	64	49
49	J47	55	83	J03	37	52	J01	38	61	63
50	094	60	73	096	64	60	J04	67	74	78
51	J35	57	73	J54	53	60	J38	64	76	79
52	J79	91	00	J81	78	94	J79	74	93	45
53	J42	80	74	J35	65	80	J31	62	75	53
54	J53	89	79	097	52	60	J09	51	62	63
55	J26	43	56	J24	56	73	J14	48	67	55
56	J17	33	38	077	29	45	072	41	60	44
57	J45	76	66	J28	58	70	J65	74	89	69
58	J39	53	59	J40	59	54	J29	62	67	
59	J44	66	61	J20	62	61	J02	51	50	68
60	J52	69	69	J51	86	87	J11	71	90	
61	J87	74	90	J75	40	87	J74	70	96	57
62	J52	77	90	J59	70	76	J53	82	81	86
63	J49	64	77	J58	78	74	J56	60	82	68
64	J69	76	89	J43	58	85	J42	61	76	58
65	J20	61	82	J08	45	71	J57	57	85	68
66	J44	75	76	J49	63	68	J50	69	79	55
67	J82	91	98	J54	41	79	J52	62	84	60
68	J39	45	63	J36	37	62	J44	37	73	53
69	J44	74	86	J17	51	81	J34	61	86	73
70	J44	47	70	J42	40	64	J47	48	51	62
71	J44	68	69	J25	47	62	J38	58	67	73
72	J60	80	92	J50	72	78	J43	70	85	72
73	J35	50	58	J37	34	78	J26	47	76	59
74	J52	71	73	J46	75	81	J37	60	75	80
75	J01	55	52	082	47	63	089	57	62	77
76	J38	66	79	J19	59	79	J24	70	83	60
77	J28	75	63	J38	48	72	J28	51	75	64
78	J23	51	46	J22	35	57	J33	48	60	67
79	J32	50	58	J16	35	58	J18	45	61	01
80	J61	75	80	J66	67	84	J54	67	83	52

Legend: 1=LL I; 2=LD I; 3=VM I; 4=LL II; 5=LD II; 6=VM II; 7=LL III; 8=LD III; 9=VM III; 10=Pre-EX.

Appendix L

ATTITUDE SCORES OF TV STUDENTS

(Legend Identifying Scales Follows Data)

Student Ident. No.	1	2	3	4	5	6	7
086	159	049	094	*J62	081	088	J54
087	J60	J03	092	J33	085	080	J30
088	J63	090	091	J45	081	080	J55
089	J71	084	082	J55	084	087	J62
090	J68	084	091	J50	077	087	J62
091	J45	076	083	J51	082	083	J58
092	J63	088	095	J11	073	071	J08
093	J44	060	061	J06	069	075	J39
094	J71	093	092	J68	089	092	J77
095	J73	088	081	J82	J03	085	095
096	J46	067	071	J40	084	062	J42
097	J66	083	073	J79	087	087	J51
098	J81	092	099	J78	082	086	J73
099	J46	087	086	J38	088	072	J47
J00	J62	092	090	J53	088	087	J31
J02	J60	081	087	J53	063	077	J72
J03	J55	085	079	J28	081	075	J16
J04	J60	079	080	J60	083	084	J56
J06	J55	083	084	J59	084	082	J60
J07	J41	076	074	J30	064	074	J64
J08	J67	090	087	J37	080	083	J35
J09	J41	084	085	J44	080	086	J46
J10	J30	067	071	J32	074	075	J29
J11	J59	066	059	J22	058	065	J09
J12	J50	079	090	J34	085	069	J37
J13	J61	081	077	J51	082	073	J44
J14	J52	082	078	J46	081	077	J47
J15	J73	081	085	J74	084	090	J60
J16	J32	068	072	J02	059	068	J03
J17	J61	082	085	J62	083	084	J57
J18	J70	J01	095	J70	093	091	J76
J19	J34	074	081	J17	077	084	J47
J20	J76	J07	096	J82	J08	J04	J72
J21	J62	088	086	J58	089	087	J55
J22	J54	062	078	J18	064	063	J48
J23	J18	071	067	J13	069	073	J19
J24	J46	089	087	J11	069	072	J09
J25	J67	087	087	J63	074	082	J71
J26	J56	081	061	J42	078	069	J56

*J=1; therefore J62 is to be read as 162, etc.

ATTITUDE SCORES OF TV STUDENTS (continued)
(Legend Identifying Scales Follows Data)

Student Ident. No.	1	2	3	4	5	6	7
J23	J18	071	067	J13	069	073	J19
J24	J46	089	087	J11	069	072	J09
J25	J67	087	087	J63	074	082	J71
J26	J56	081	061	J42	078	069	J56
J27	J58	089	095	J62	089	088	J68
J28	J61	088	091	J62	087	091	J62
J29	J46	081	076	J60	094	081	J57
J30	J38	074	065	J17	069	072	J35
J31	J61	089	080	J60	088	086	J63
J32	J61	083	081	J53	080	091	J80
J33	J54	081	084	J60	080	087	J58
J34	J81	087	074	J75	092	068	093
J35	J29	077	065	098	059	059	J10
J36	J21	070	078	J18	068	078	J21
J37	J58	090	081	J59	090	088	J73
J38	J43	085	086	J49	087	087	J56
J39	J51	071	072	J44	057	067	J50
J40	J58	086	087	J60	087	087	090
J41	083	090	077	076	079	088	084
J42	083	072	085	083	086	082	084
J43	066	071	073	070	079	070	068
J44	096	094	082	088	083	088	099
J45	061	067	085	066	063	087	073
J46	075	072	072	071	066	087	J36
J47	J38	061	058	J36	067	050	J50
J48	J81	084	076	J88	077	094	J83
J49	J02	059	054	J52	082	082	J59
J50	J42	075	077	J73	J07	087	J92
J51	J58	081	081	J67	088	088	J63
J52	J73	094	085	J56	091	090	J65
J53	J36	098	J00	J23	J01	092	J21
J54	J20	081	065	J35	070	070	J19
J55	J59	090	089	J60	087	093	J55
J56	J02	068	068	J19	067	070	J26
J57	J57	093	091	J58	090	090	J51
J58	J75	088	087	J50	089	093	J48
J59	J64	092	082	J54	075	089	J60
J60	J83	J02	J02	J66	085	J02	J70
J61	J66	099	096	J71	092	097	J78
J62	J62	085	082	J21	073	066	J48
J63	J84	J02	098	J92	J01	J01	J90
J64	J62	094	087	J49	084	080	J52

Legend: 1=LL I; 2=LD I; 3=VM I; 4=LL II; 5=LD II; 6=VM II; 7=LL III.

ATTITUDE SCORES OF TV STUDENTS (continued)

(Legend Identifying Scales Follows Data)

Student Ident. No.	8	9	10	11	12	13
086	090	076	73	75	74	71
087	093	087	56	49		46
088	089	087	75	52	65	59
089	093	082	59	46	44	42
090	085	090	76	55	54	50
091	087	097	59	50	32	54
092	069	083	57	44	54	48
093	083	074	61	61	60	58
094	094	091	77	70	59	61
095	J03	J04	88	61	43	47
096	077	072	86	59	56	67
097	086	085	65	46	44	41
098	087	088	45	44	39	43
099	081	075	58	43	43	58
*J00	081	080	57	53	50	47
J02	088	095	60	55	61	56
J03	073	075	82	54	57	57
J04	080	078	59	53	55	53
J06	090	086	64	42	41	42
J07	086	089	90	78	63	43
J08	085	079	62	51	60	57
J09	083	083	70	58	59	59
J10	073	073	93	61	54	58
J11	065	068	84	78	69	71
J12	086	090	87	52	63	59
J13	081	083	72	57	53	58
J14	084	079	75	59	63	64
J15	080	084	58	57	51	47
J16	066	078	65	62	59	54
J17	084	090	60	46	46	50
J18	J00	098	62	48	44	46
J19	081	087	74	63	67	68
J20	099	J02	41	37	32	32
J21	081	086	43	42	39	37
J22	076	076	84	63	63	63
J23	069	061	94	48	60	71
J24	075	054	66	63	61	59
J25	089	094	81	39	48	40
J26	078	072	81	52	50	56
J27	090	090	81	57		64
J28	090	087	77	45	46	47
J29	087	087	89	40	30	29
J30	074	072		42	54	60
J31	091	098	57	42	44	46
J32	096	092	66	53	51	43
J33	090	087	64	48	44	49
J34	J04	096	77	61	57	54
J35	069	069	75	54	68	62
J36	079	088	64	50	57	51
J37	092	083	82	61	46	48
J38	089	090		62	59	61
J39	066	071	79	94	01	94
J40	080	090	74	56	25	54
J41	078	085	70	59	60	56
J42	080	087	98	54	61	72
J43	093	075	84	59	55	62
J44	087	097	74	64	61	63
J45	063	075	95	61	73	73
J46	070	067		56	70	68
J47	069	070	75	74	64	59
J48	097	096	82	52	46	51
J49	091	087	63		52	54
J50	096	J00	65	57	58	53
J51	084	073	62	54	43	45
J52	081	087	60	61	58	55
J53	091	080	36	39	50	43
J54	069	067	49	53	62	66
J55	085	087	83	51	51	35
J56	075	075	97	61	50	48
J57	089	090	90	48	49	48
J58	082	081	64	56	60	64
J59	087	089	52	52	49	45
J60	J00	J03	80	40	37	42
J61	099	098	62	39	44	33
J62	069	071	59	58		48
J63	J04	J03	74	43	38	44
J64	086	086	47	45	51	52

*J=1; therefore J00 is to be read as 100, etc.

Legend: 8=LD III; 9=VM III; 10=Pre-EX; 11=Post-EX I; 12=Post-EX II; 13=Post-EX III.

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